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Last Sunday's Shut-down

THE growing dependence of a very large proportion of our population on electricity was exemplified in an unfortunate way last Sunday morning, when the South-East England grid area was without supplies for periods varying in different localities from a few minutes up to a couple of hours.

The effect on the public of a spectacular failure of this kind is out of proportion to any material loss. While no one who has experienced the benefits of electricity would change to anything else because his supply had been interrupted, reports of unreliability do frighten off the still greater number of potential users. Most people had expected that grid operation would make supply more reliable, and the recent breakdown has caused surprise and consternation to the layman.

Points for consideration are the initial cause of failure, the reason for its spreading over the whole system, the amount of plant running in relation to the load, the disposition of the reserve, whether undue operating risks were taken having regard to the intricacies of interconnected running with a staff that had no long experience of the particular system, and, finally, the functioning of the human element.

Inquiries of the authorities indicate that the trouble probably originated on the London Power Co.'s system, and effects should have been confined to it, as the "bump" was little more than has been sometimes experienced before with grid running without noticeable effect on consumers. In this case, however, a 70,000-kW set at Battersea and two 35,000-kW sets at Deptford West tripped out. The thirteen other stations on the 132-kV rings took up 90,000 kW between them and coped with it satisfactorily for a quarter of an hour until the third Deptford set, for some reason which is not clear at present, was switched out. This overloaded the lines out at Barking, bringing out the Thames crossing feeder; then the network collapsed.

The plant running at the various stations seems to have been adequate to carry the system load of 300,000 kW with a margin of reserve that was ample and well placed strategically. With regard to the question of risks taken, one-hundred-per-cent. reliability is, we fear, unobtainable, and ninety-nine per cent. only at prohibitive cost. Operation engineering, in some aspects, consists in a correct selection of risks.

Last week-end some of the 132-kV lines radiating from Barking were out of commission for inspection. The risk of keeping them in service was presumably considered greater than the likelihood of sudden failures at both Battersea and Deptford West—two of the best modern stations in the country. It turned out otherwise, but it will be generally expected that every effort will be made to prevent a recurrence.

Reading between the lines of the various reports of the occurrence, the men at the control points seem to have kept their heads admirably in a trying situation, but when a huge concern like the London Power Co. operates a grid within a grid the difficulties of maintaining at the outset of co-ordinated operation complete contact between the control engineers of the Board and of the company is manifest.

We have dealt here only with the broad points at issue. Many details are still obscure, but these we may rely upon the engineers concerned to investigate thoroughly in order to strengthen the public confidence in the national scheme.

Is Co-operation Possible?

OUR review of Sir William Ray's address delivered at the Buxton Conference of the Electrical Contractors' Association has led a Staffordshire correspondent to express his displeasure at our attitude ("Is Co-operation Possible?," ELECTRICAL REVIEW, July 6th, p. 1). He views it as indicating a departure from our long unbiased record of regard for the interests of the electrical contractor. Our efforts to discover what has led him to such a belief reveal that he is not anxious to hear so much about the interests of the consumer, and would like to hear more about the well-being of the contractor. But one can hardly ignore the important fact that a satisfied consumer may mean both

prosperous contractors and successful supply undertakings. Our critic adds that local supply companies and contractors in his area are working co-operatively, and both are making profits. Not only is this as it should be, but, as we have shown over and over again, it is what is happening in many places. Sir William's object was to find some basis upon which close co-operation could be introduced where it does not now exist. The contractor has learned from experience that the interests of the consumer must lie very close to the heart of the supply engineer—he is under obligation to serve him, and the better he does so, either directly or through a contractor, the larger will be the increase in his output. Nobody will overlook the fact that the electrical industry is made up of many separate sections, which are all interested in reaching the best solution of this particular problem, and everybody, whether discouraged by past efforts or not, will hope that success may attend the new effort which E.D.A. is stated to be making to confer with the contractors.

A Sense of Proportion

An ability to appreciate the relative values of various factors that go towards sound development is not the least of the qualifications required of a chief engineer and manager of a supply undertaking. In the analysis which Mr. A. T. Bullen makes on a later page we think he might have claimed more with regard to the reduction in average price for industrial consumers. This reduction may be due to the opening up of new factories, as he suggests, but it does not follow that the load will automatically come to the supply authority. Credit is due to the initiative and negotiating skill of the undertakings' engineers in the face of competition of the heavy-oil engine.

A Japanese Grid

A five-year plan is proposed for the unification, co-ordination, and better distribution of electricity in Japan. An English daily states that a large construction programme for new hydro-electric works and extension of distribution systems, with a view to cheapening prices, is recommended, with Government subsidies and control. The use of electricity in industry has made considerable progress there in the last decade; a bulletin issued by the Electrical Association of Japan shows that four-fifths of the total horse-power is derived from electric motors. The existing 154-kV transmission lines running up to 250 miles over partly mountainous country apparently cause no appreciable difficulties. More than 85 per cent. of the output is produced from water, but, paradoxically, lowered prices of coal have enabled the hydraulic stations to be operated more efficiently. This is because the steam reserves enable the water to be harnessed on the basis of a six-months' flow.

Training for Business

The facilities that exist in the Department of Business Administration of the London School of Economics for training University graduates for executive positions in industry are being extended next session. A further number of important companies, including several well-known electrical manufacturers, have added their names to the list of those undertaking to find posts a year hence, on a basis agreed upon in advance, for young men who have just taken their degrees and are willing to follow the Department's training in business principles and methods for the October-June session. The Department was established in 1930 through the joint efforts of business firms and the School authorities, and fifty students of the ages 22 to 25 have so far passed through, covering in their progress such subjects as marketing, production, finance and statistics, accounting and personnel management. Current practice is investigated and taught, works are visited, and discussions take place between students and business men. Other electrical or engineering firms anxious to investigate the scheme, or young men possessing suitable qualifications, will be well advised to get into touch with Mr. Jules Menken, the Head of the Department, at 11, Clement's Inn Passage, W.C.2.

South African Power Progress

Though the modification in charges to the mining industry caused a decrease in the net profits of the Victoria Falls Power Co. for the year 1933, the extension of agreements for the sale of power from 1942 to 1950 has added stability. Under these agreements the charges will vary in accordance with the results when compared with those for 1933. The demands of the mining groups continue to increase, and a large new power station is being erected in the Vereeniging district. It will begin with a capacity of 100,000 kW, reaching ultimately to 350,000 kW. Mr. A. E. Hadley informed shareholders, at the meeting in London last week, that the main contracts for this (the Klip) power station had been placed. In view of mining activities outside the company's supply area arrangements had been made with the South African Electricity Supply Commission for this new station to belong to the Commission. The company will operate it and take the entire output at cost price. The licence for supplying the new areas will be ceded to the company by the Commission, and the former will operate the Commission's transmission system in these areas.

Burning One's Fingers

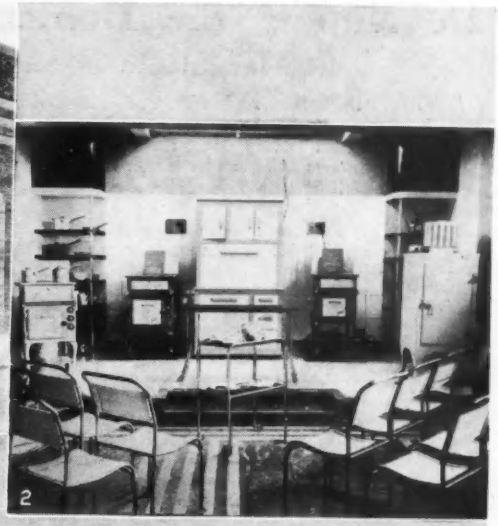
Good conductors of electricity are also good conductors of heat. Why then use metal for knobs of switches of the tumbler type when they form an integral part of apparatus designed to get hot? The other day the almost satisfied owner of a dish-warmer—a most efficient and well-finished article—grumbled that when one tried to switch it off with ungloved hand the hot metal knob burnt the fingers. He seemed inclined to deduce from this that there must always be some minor drawback to the use of electrical appliances. Illogical, maybe, but small things like this do count.

The Phœnix

The Overhead Lines Association is to be dissolved after an existence of nearly seven years, but it will be recreated as the Transmission Section of the Institution of Electrical Engineers. On September 30th, 1927, we referred to the formation of the new body and suggested that its fundamental purpose should be to cheapen the supply of electricity in rural areas. It has done good work towards that end, and in addition to providing a forum for the discussion of practical problems, it has helped considerably to create an atmosphere favourable to overhead development. In its reincarnation the O.L.A. will retain its group character, as only engineers actively engaged in the design, construction, or operation of transmission and distribution lines (overhead or underground) will be eligible for membership of the Section.

Domestic Consumption

An engineer of an undertaking with a mixed district of urban and rural consumers showed us the other day the figures on which, from experience, he bases his estimates of average consumption for the more usual domestic appliances. The kWh he expects from each is: water heaters 2,000, cookers 1,300, fires 600, refrigerators 500, kettles 400, irons 80. Even if only two fires were installed and used during the year for the relatively few hours indicated by this estimate the annual consumption for the house with one each of the other appliances would be about 5,500 kWh. It would be of interest to know how this compares with the experience of other readers.



Methods of Developing the Domestic Load. **(See next page)**

1. A modern showroom exterior (Swindon Corporation). 2. The Swindon demonstration theatre. 3. The demonstration kitchen of the West Ham Electricity Department. 4. A cooker repair and maintenance shop at West Ham. 5. A children's créche and play centre (West Ham). 6. The interior of the main showroom at Warrington. 7. The living room of a model all-electric flat at the London Electric Supply Corporation's showrooms.

Developing the Domestic Load. By William F. Jarvis*

The importance of hire schemes and efficient maintenance

ALTHOUGH the statement has been reiterated *ad nauseam* it is still true that the domestic load has hardly been touched as yet. Every undertaking in the country can be sure of continuous work and an ever-increasing demand from this source if it will only make the necessary efforts. These efforts are of a varied character, and in this article the principal courses to pursue are dealt with.

First and foremost it is essential that the undertaking should have a reasonable and intelligible method of charging for electricity. Tariff fixing is too large a subject for incidental treatment, but it may be said that an "all-in" domestic charge system is essential. The method of assessing the fixed charge in a two-part tariff has to be carefully considered so that it is adequate without being repellent. This applies particularly to the fixing of the charge for a large house on a rateable-value basis; a strict adherence to the *pro rata* rule sometimes produces a fantastic figure for a house with a high rateable value.

Forms in connection with assisted wiring, hire and hire-purchase schemes, should be as simple as possible. All but a very few people will honour their agreements; it is not good business to frighten the large majority with lengthy and unreadable legal documents as a safeguard against the few possible delinquents.

The hiring of electrical appliances at reasonable rates definitely encourages and rapidly increases the domestic load. Two Lancashire towns of approximately the same population have simple hire and hire-purchase schemes respectively. The town with the hire scheme installed approximately 1,000 cookers during the year ended March 31st, 1934, whilst the other town sold only about 600 cookers during the same period. This was in spite of the facts that the hire charge is fairly high, whilst the town with hire-purchase only offers exceedingly attractive terms over six years, and that the town with hire-purchase facilities has cookery lecture-demonstrations at very frequent and regular intervals in its own demonstration kitchen, while the other town does not have demonstrations owing to lack of accommodation. Some undertakings have adopted a "free" hire scheme, but it is too early as yet to forecast the economic result of this.

A striking and informative showroom window display

If the prospective customer is told that to obtain the best results she must use special utensils with her cooker she will often strongly object, and if the point is glossed over complaints of a more bitter nature are received as regards boiling times and costs. It is in the supply department's interest, therefore, to supply with the cooker at least, say, a 5/6-pint flat-bottom pan and a 3-pint flat-bottom kettle, with 8¼ in. diameter bases. Moreover, their frequent use reduces the temperature of the hotplate fairly considerably, and so prolongs its life.

One well-known undertaking, when wiring for a cooker, provides a cable of sufficient cross-section also to carry a wash boiler. It is then only necessary to run a short length of cable from the wash boiler to the cooker control switch, when a wash boiler is installed.

Although some engineers may dislike the hire of cookers, no such qualms can exist as regards the simple hire of immersion heaters, storage heaters, good wash boilers, fires, kettles, irons, &c., because the maintenance costs are low. It is necessary, of course, to stipulate a certain minimum hire period for appliances.

Maintenance

It is obvious that appliances out on simple hire have to be maintained by the electricity department, without charge to the consumers, unless the breakage or fault is due to gross carelessness or negligence. With goods on hire-purchase, some undertakings guarantee the appliance only for the period stated by the manufacturer, which is sometimes less than the hire-purchase period. Not only does this cause a set-back as regards the sale of the cooker, but it would undoubtedly have a "boomerang" effect on the authority in the future. The appliance should be maintained free of charge to the purchaser over the whole hire-purchase period.

Every large undertaking should have a repair and reconditioning shop, especially where the old type of all-black enamel cooker is to be dealt with. Hot soda baths should be available so that the dismantled cooker can be dipped to remove grease and grime from hob, sides, oven interior, &c., and either a stove enamelling plant or cellulose spraying outfit should be installed.

One well-known undertaking in the South has resprayed the older type of all-black cooker in pastel shades which have proved popular. Smaller undertakings, adjacent to one another, could run such a shop on a co-operative basis

Showroom Staff

If the supply authority does not possess a showroom it should acquire a prominent position on a main street. It is desirable that the engineer and manager, accounts, mains and meter test departments, together with the general clerks, should be accommodated in the same building.

Good large windows should be available, incorporating incomparable window lighting, and, it is hardly necessary to say, the exterior should be of an inviting appearance.

There should be a showroom and sales superintendent who will be responsible to the engineer for the whole of the domestic sales and publicity side of the undertaking. This man should have had a good grounding and training in theoretical and practical electrical engineering, together with a sales and advertising training and ability. There should also be a fully qualified female demonstrator.

The size of the undertaking will determine the number of sales assistants required, both for the showrooms and outdoor selling. The receptive type of individual is more suited for the showrooms than outdoor sales work, which demands a slightly more aggressive type.

One way to encourage sales is to set every salesman a quota, and offer a prize to the member of the staff who shows the biggest proportional increase over and above his quota. A small sales conference could be held once a month, when all matters appertaining to increased sales could be thrashed out. Selling points and talk could be analysed.

Skill and ingenuity should be brought to bear on dressing the windows, in order to attract favourable attention. The interior of the showroom should have a restful atmosphere and goods should be displayed so that they are easy to handle.

If possible, arrangements should be made so that the electricity accounts are paid in the showroom. A separate counter is generally provided, and so arranged that consumers have to walk through the showrooms to pay their accounts. One well-known undertaking has a glass case by the side of the accounts counter in which a demonstrator displays cakes and pies cooked by electricity.

A very necessary form of propaganda is a demonstration theatre in the showrooms, where cooking, washing, and water-heating lecture-demonstrations can be given. Whilst the food is being cooked, or the washing is in progress, the demonstrator should explain the tariff and form of charges for electricity in simple, everyday language. She should also mention the assisted wiring scheme, simple hire and/or easy hire-purchase schemes. She should then make absolutely certain that everyone present understands the scale of charges ruling in the area.

The demonstrator should encourage the consumers or prospective consumers to ask questions relating to the use of electricity. The names and addresses of all people present at the

* Showroom and Sales Superintendent, Bury Corporation Electricity Department.

demonstration should be obtained, and those that do not "sign-up" for a cooker after the demonstration can be approached a few days later in their own homes, by the demonstrator or domestic sales representative.

One undertaking has turned a spare room into a children's nursery so that mothers can leave their children under expert care and attention whilst they themselves attend the demonstrations; books and toys are provided for the children's amusement.

Publicity

Under this general heading comes newspaper advertising, poster and cinema publicity, distribution of circulars, booklets and direct mail advertising. Private concerns, particularly the large departmental stores, discovered the value of extensive advertising long ago. Many firms allocate 4 per cent. and upwards of their income to advertising, whereas some supply authorities allocate as little as ¼ to ½ per cent., while others spend practically nothing in this way. Direct mail advertising is particularly suited to the requirements of the electricity supply department. This matter was dealt with at some length in a recent article in the ELECTRICAL REVIEW.

Local electrical exhibitions are a very useful form of propaganda and should be encouraged. It is the usual practice for the supply authority to supply the hall and energy free to manufacturers who exhibit. Obviously, cookery, washing, and water-heating demonstrations should form an integral part of the exhibition, and the wise organiser will incorporate some novel feature such as an all-electric coloured fountain, electrical "acts of magic," or a show without players by means of synchronised gramophone records, reproduced by pick-ups and loud-speakers.

In the case of the all-electric show house, the undertaking should act in constant co-operation with local architects and builders pointing out the new and exclusive selling points which can be theirs (at no extra cost), with the building of all-electric or coal-electric houses. The department should co-operate by equipping a "show-house" with various appliances and floodlighting the exterior. The sales staff will find that local furnishers will gladly lend their aid.

Electricity Supply Values. By A. T. Bullen, M.I.E.E.

The relative importance of the various factors

HIGH standards in electricity supply are contingent upon a proper blending of the engineering with the commercial and the financial, and a full appreciation of the relative importance of statistics.

Electricity supply is largely affected by fluctuations in other industries, and an undertaking in an industrially depressed area might, despite a decrease in the number of kWh sold, have made more solid progress than one more favourably situated the output of which, due to new building or some other cause, has increased perhaps by as much as 20 per cent. An examination of the statistics giving the progress of the Welwyn Garden City Electricity Co., Ltd., for example, will show the relative importance of the various items:—

Table 1.—The Whole Undertaking

Year ended Dec. 31st.	Pop'n at end of year.	No. of consumers at end of year.	Total kWh sold.	M.D. in kW.	Load factor %.	kWh sold.	
						Per head of pop'n.	Per consumer.
1924	2,570	661	248,245	156	18.2	97	376
1927	6,236	1,757	1,598,066	608	30.0	256	910
1930	8,540	2,413	4,101,688	1,560	30.0	481	1,700
1933	9,250	2,628	6,699,990	2,560	29.9	724	2,550

Table 2.—Domestic Consumers

Year ended Dec. 31st.	No. of consumers at end of year.	Total kWh sold.	Average per consumer.	Average price obtained.	No. of cookers in use.	% of total domestic consumers.
				d		
1924	637	121,643	190	6.51	8	1.25
1927	1,709	691,148	405	2.96	314	18.3
1930	2,310	1,791,456	775	1.77	901	39.0
1933	2,490	2,783,106	1,118	1.59	1,312	52.7

Table 3.—Industrial and Commercial Consumers

Year ended Dec. 31st.	No. of consumers at end of year.	Total kWh sold.	Average per consumer.	Average price obtained.
				d.
1924	24	119,572	4,982	1.93
1927	48	881,230	18,359	1.80
1930	103	2,253,961	21,883	1.34
1933	138	3,832,851	27,774	0.96

Table 4.—Financial

Year ended Dec. 31st.	Total capital expenditure.	Gross revenue.	Gross profit.	Gross profit as % of capital expenditure.	Capital in apparatus for hire.	% of total capital expenditure.
	£	£	£		£	
1924	24,938	4,718	861	3.5	100	0.4
1927	50,592	18,423	3,921	7.7	2,428	4.8
1930	80,953	29,511	10,290	12.7	11,200	13.8
1933	95,209	38,630	11,549	12.1	20,008	21.0

The only item of first-class significance in table 1 is the improvement in the load factor between 1924 and 1927 and its maintenance at 30 per cent. since then. The relative importance of the increase in kWh sold and of the increase per head of population is very small indeed. A single large factory in any year might have been sufficient to account for these, but table 2 reveals steady increases in the consumption per consumer of the domestic group.

This is positive progress and its relative importance cannot be over emphasised. The undertaking that continually increases the average consumption per domestic consumer is making real progress, even if the vagaries of industry are such as to cause a set-back in the total kWh sold.

In the same table the progress in electric cooking has a high relative importance. From 1930 to 1933 the number of consumers increased by 180 only, but the number of cookers connected increased by no less than 411; an increase of 2.3 cookers to every new consumer is good going.

In table 3 there is little of note except perhaps the fall in the average price, but even this is relatively of less value than the increase per consumer in table 2. Prices must fall as consumption increases, and the more they fall the greater is likely to be the increase. At the same time it does not follow, particularly in an industrial group, that the latter is directly the result of the former. More likely is it to be an indirect result, such as the opening up of new factories.

The item of greatest relative importance in table 4 is the high proportion of the total capital devoted to the provision of appliances for hire. It is this expenditure which has resulted in the great increase in the consumption per domestic user which, relatively, is without doubt the most important fact brought out by the tables.

Continuity of Supply

Some of the more common problems requiring the exercise of wise discrimination are as follows:—First, there is the eternal question of safety or continuity of supply as against cheapness. This question, perhaps, becomes most acute in rural areas, where by far the greatest cost is that due to the capital expenditure necessary to deliver the supply.

Low capital cost, therefore, appears to be of prime importance, but if cheapness is carried too far maintenance and line losses are likely to outweigh any capital saving, added to which the consumers soon become dissatisfied if there are constant interruptions in the supply. I was once told of a case where the supply failed on five successive Sundays while the dinner was cooking, with the result that after much hard work in obtaining cooker consumers a good number of these reverted to gas. Someone had not fully appreciated the relative importance of an adequate and safe supply as against a cheap supply. Financial interests are, as a rule, too eager to curtail expenditure, and for this reason electricity undertakings must not be allowed to get too much under the control of the financial experts and accountants.

Mr. A. T. Bullen: A biographical note appears on page 165

The next question is that of the relative importance of selling the maximum quantity or making the maximum profit. The

former does not necessarily produce the latter immediately, because to increase the sales it is often necessary to lower the tariff, and this usually means a temporary reduction in profits. That lower prices will ultimately result in increased profits is practically certain, but this automatically brings us to the question of the relative importance of making profits now or taking the risk of deferring them to some future date when, owing to new inventions or fluctuations in industrial prosperity, conditions will have so altered as to upset the calculations. Yet progress depends on a readiness to sacrifice immediate results in an endeavour to build up for the future.

The Working-class Consumer

This brings us to the next point, which is the need to place within reach of consumers means to increase their consumption by schemes of hire and hire-purchase of the numerous current-consuming and labour-saving appliances now available. To appreciate this question fully the importance of the working-class consumer must be balanced with that of his better-off brother. The possible working-class consumers outnumber the others by perhaps 10 to 1, and the potential development of domestic electricity lies mostly in such households. Thus it would appear to be beyond dispute that the importance of hiring schemes and such is considerable.

This introduces a question as to the relative importance of suitable publicity matter. A prominent engineer at the recent annual meeting of the Electrical Development Association put in a plea for a kind of publicity which would appeal more to the working classes, and it is essential that we should destroy the illusion that electricity is a luxury for the rich.

A question that has caused considerable controversy is whether the rentals charged for apparatus should be sufficient to cover the capital charges, maintenance and depreciation, or whether the schemes should be subsidised out of the sales of electricity. People who quibble about this do not appreciate the relative importance of the hiring scheme. If you can place the apparatus at the strictly economic rental then do so by all means, but if you cannot then you must fall back on something less ideal.

Electricity is purchased by undertakings on a two-part basis, and a very large proportion is sold by means of some form of tariff which includes a fixed charge and a running or unit charge. What is the relative importance of the fixed and running charges? Almost any two-part tariff is advantageous to the high-load factor consumer, and for this reason we appear to be allowing load factor to dominate all our tariff considerations. In practice a group of low load-factor consumers may be quite as profitable, or even more so, on account of their high diversity. In most tariffs diversity is taken into account only in a general way, total standing charges being expressed in terms of simultaneous maximum demand, but it is rarely recognised in individual tariffs.

Cooking Development

In Welwyn we have our maximum demand in the middle of the day, which is a result of the cooking development. During the winter of 1933-34 the maximum mid-day load was 2,560 kW, and the maximum evening load (between 4.30 and 5 p.m.) 1,680 kW, both readings being recorded on December 14th. The difference of 880 kW is quite a useful load to the generating stations in the middle of the day, and does not come into the maximum simultaneous demand at all, but the tariff of the Central Electricity Board makes no allowances for this.

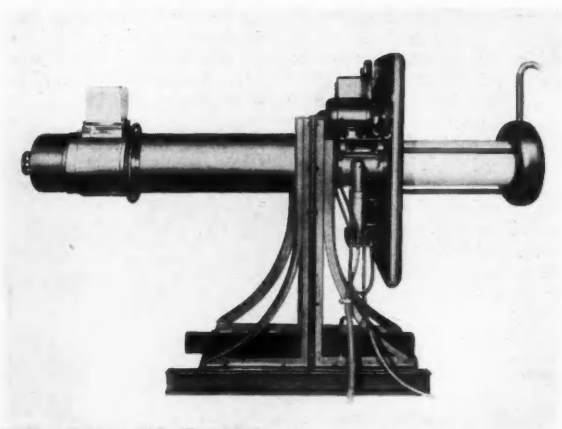
To charge for this load at the standard rates would retard the growth of the cooker business, because, if cooking had to stand this extra charge the costs would be increased to such a figure that a competitive retail tariff would be impossible. It is encouraging to find that, in the Electricity (Supply) Bill recently introduced into Parliament, a special clause is included to allow the Central Electricity Board to make special tariff arrangements to meet special cases, which goes to show that the C.E.B. appreciates the relative importance of diversity.

In making tariffs not only must the relative importance of diversity be appreciated, but also the relative importance of the fixed charge as compared with the running charge. A reduction in the fixed charge with a slight increase in the running charge would often definitely increase the consumption of electricity. Particularly is this the case with lightning, where a high kW charge tends to restrict the amount installed, although it is now common knowledge that to increase the lighting intensity is also to improve the load factor. The kW charge, then, should be kept as low as possible so as not to limit this intensity.

If the general standard is not right it is because we are not properly balancing the financial against the technical, or vice versa. It may be too high because we are paying too much attention to safety of supply and consequently paying too dearly for our plant and mains; it may be too low because we are buying the cheapest of everything without bothering about performance, or possibly because we are draining our resources to produce immediate profits. The rapid increase in electricity sales may cause us to confuse mere growth in output with real progress and incline us to rest on our laurels when there is still so much work to be done.

An X-ray Development

AT the recent opening by the Duchess of York of the Sheffield Infirmary's Radium Centre, Sir Ronald Matthews referred to the installation of a new X-ray deep therapy set that has been supplied by the Research Department of the Metropolitan-Vickers Electrical Co., Ltd. The equipment, under the control of Dr. F. Ellis, comprises two X-ray tubes and the necessary associated apparatus operating at 200,000 V.



A continuously evacuated X-ray tube on a temporary stand

The arrangement is such that it is possible to treat two patients simultaneously with the minimum of complication. The high-voltage X-ray tube for deep therapy treatment has been made practicable by the production, in the company's laboratories, of a range of low vapour pressure oils for use as working fluids in condensation pumps, thus enabling the highest vacua to be attained without using liquid air or other cooling media.

Dismountable continuously evacuated tubes possess two great advantages, namely, that the ease with which filaments, targets, &c., can be replaced eliminates the costly tube renewals necessary in a sealed-off apparatus, and that once the tube has been conditioned no great care need be taken in the application of the high voltage. With a sealed-off tube a delay of anything up to ten minutes can be experienced on account of the necessary gradual application of the high voltage in order to avoid puncturing the fragile glass envelope.

The tube is of robust design and is continuously rated at 200 kV, d.c., 10 mA. Adequate safety factors are provided; for example, the external spark-over voltage is about 300 kV, while that for the internal parts is much higher. The target is at earth potential, and it thus becomes possible to cool it with water from the ordinary high-pressure mains; 6 kW may be dissipated in 1 sq. cm. of gold target cooled in this way.

The limitations in turning off the tube imposed through the presence of the pumps are overcome by arranging the target to be rotatable. Applicators are employed for defining the X-ray beam, which can be utilised for about 300 deg. around the tube axis. In addition, the complete tube is arranged to be movable vertically through a distance of about 5 ft., a lift mechanism with dual control being used. The tube is lead-lined and is completely safe, even though a skin burn can be produced in two minutes if the exit port is touched.

The continuously evacuated rectifiers are made of electrical porcelain and steel, and they have no glass in their construction. Evacuation is by a standard pumping unit, and a novel design enables filament renewals to be carried out rapidly.

All of the equipment—X-ray tube, rectifiers, and pumps—is completely automatic; a simple press-switch starts a pumping sequence, which ends with the switching on of the filaments. Vacuum relays control the electrical circuits in relation to the vacuum conditions, while illuminated diagrams show the state of both vacuum and electrical circuits.

An Electrified Farm. By Nina Dyson Rayner

I RECENTLY spent a few days on a farm in the Midlands, and was amazed at the improvement due to electrification since last I was there, when oil lamps and candles were still used. The capacity of the farm has now been increased, the machinery being so reliable that it has enabled other branches of farming to be developed; there is also a general air of progress and prosperity about the place.

Electric lamps in outdoor fittings, with reflectors, now give an excellent light all round the farm and buildings. Hitherto all journeys had to be performed with the aid of flickering hurricane lamps. The exterior lights are controlled by a switch in the farmhouse, but multi-way switching is provided in many of the farm buildings, as these have several entrances. The time and labour saved on various operations carried out in the barns and milking sheds is almost incalculable; 100-W lamps are installed in the barns and 60-W lamps in the stables and cowsheds.

An electric pump, automatically controlled by a float switch, fills a storage tank, from which pipes are laid to the drinking troughs in the farmyard, sheds, and fields. In the milking shed I saw two cows being milked at the same time with one ½-h.p. portable milker mounted on a small truck. The running cost averages 1d. per week per cow, one kWh being consumed for the milking of twenty-four cows. With the petrol engine formerly installed there was often delay in starting on a cold morning, but now, with an a.c. motor, work is begun straight away.

The milk is cooled by an expansion cooler with a refrigerator attached. The temperature of the cold room is automatically regulated. During three months of the hottest period last year when the cooler was running at its maximum output (approximately 2,000 gallons per week) the plant consumed 400 kWh.

Efficient, Clean and Inexpensive

The low margin of profit on perishable articles necessitates low running charges. These can now be achieved by electrical methods, which occupy the minimum of floor space and require no labour for cleaning and stoking. I went into the cost of several operations that were performed in the dairy and found that about 25 lb. of butter could be churned, 200 lb. of cheese curds ground, and 1,000 bottles washed and then filled with milk for approximately 4½d. per day. The separators, butter-workers, churns, and bottle-washing machines were driven by one portable motor mounted on a tripod, and coupled to each machine as required. Swill for the pigs is pumped from a sunken concrete basin along iron pipes into all the styes.

On this farm all the grain is crushed, as required, by a 3-h.p. totally enclosed electric motor, with a push-button controller, coupled direct to the grinding and crushing mill, thus saving floor space. For winter feeding a chaff cutter with two knives, coupled direct to a 2-h.p. motor, will cut about 15 to 18 cwt. of chaff in about one hour, whereas a labourer could only manage to cut about 4 cwt. in the same time.

By means of a "Teles" portable cross-cut saw with a 5-ft. blade, driven by a 3-h.p. motor, timber up to 4 ft. in diameter can be cut through in eight minutes. After setting the saw and switching on the current the farm hand can leave it and attend to other duties, for on the completion of the work the motor stops.

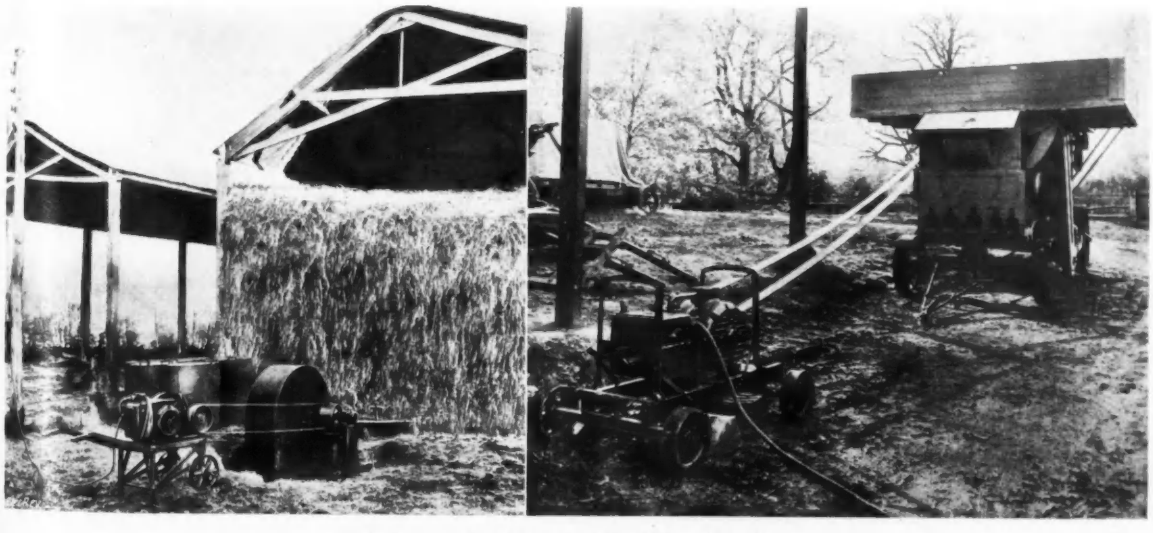
An electrical clipping machine is responsible for one man being able to shear forty sheep in a day. The old hand-driven clippers are now driven by a small ½-h.p. motor fixed on a portable tripod.

Ploughing on this farm is done by an electric tractor on which is mounted a 15-h.p. motor and control gear; a trailing cable conveys the current to the tractor. The saving in labour and transport costs due to the absence of a need to provide fuel and water is considerable. Root pulpers and other seasonal drives are operated from a transportable 5-h.p. "Drumotor," which is composed of a steel drum containing the power unit and control gear with provision for coiling a fair length of cable around the drum when moving it.

Electric soil-heating cable being laid in a hot-bed

The threshing machine is in course of conversion to electric drive. The "Witton" 15-h.p. motor that is used for the plough is being fixed on a portable truck placed near the stack.

The farmer is not governed by the weather as to when he may gather his crops, for when cut it is carted and stacked. The stack is built over ducting and chambers formed in the interior during building. Air is then forced through the ducts by means of a centrifugal fan driven by a 5-h.p. motor (G.E.C.). This drying operation, which takes only a few hours daily, is repeated at intervals in periods of about eight or ten days.



Curing hay in the stack (left) and a thresher

In the poultry houses chicks are kept warm by electric foster mothers. The consumption of carbon lamps is approximately one kWh per chick for eight weeks, temperature control being automatic. Drinking water is also warmed, and it has been found that the claim that this keeps the birds in good condition and also aids egg-production is justified. The use of electric lighting for stimulating egg-production is also found to increase the number laid by the fowls when prices are high.

Early lettuce is produced for table use by the farmer's wife, and she has reason to be proud of these and other vegetables, which are ready to be picked at least three weeks before the normal time. The lettuce bed and nursery hotbeds, where she has boxes of seeds and cuttings, have electric bottom heating by means of a cable ("Magnet") consisting of a resistance wire covered with asbestos tape, lead covered, and finally braided and compounded.

The temperature can be automatically controlled; for tomato growing, a ten-hour heating period at night is arranged, maintaining the bed at about 70 deg. F. No energy is consumed throughout the day, and it has been found that no more than two or three degrees have been lost before the current is switched on again. At the end of three weeks from planting out, current is switched off altogether, as the plants are always so well advanced that further heating is unnecessary.

The farmer's wife said that electricity does most of the household tasks on which she or the maid had previously to spend endless time, and with better results. She was persuaded to electrify as a result of a visit paid to this country by her sister, married to a Canadian farmer, who reported that in America there are very few badly equipped kitchens, and about 90 per cent. of the houses dispense with maids and employ the latest electrically operated labour-saving appliances.

My friend is enthusiastic about the electric washer, fitted with a roller ironer, which so effectively launders all the milking overalls and other garments. She also has a drying cupboard and two electric irons, and quite recently she has fallen a victim to the lure of an electric cooker. Previously, she had been under the impression that electric cookery was a luxury to be enjoyed by the affluent alone, but now she knows differently, and the ease with which the temperature can be regulated leaves her free to superintend the cheese-making while her meals are cooking.

In this quaint old farmhouse there are six electric fires, varying from one to three kW, as an auxiliary to central heating. During severe frost small electric heaters are also used to prevent freezing in outbuildings and pumps.

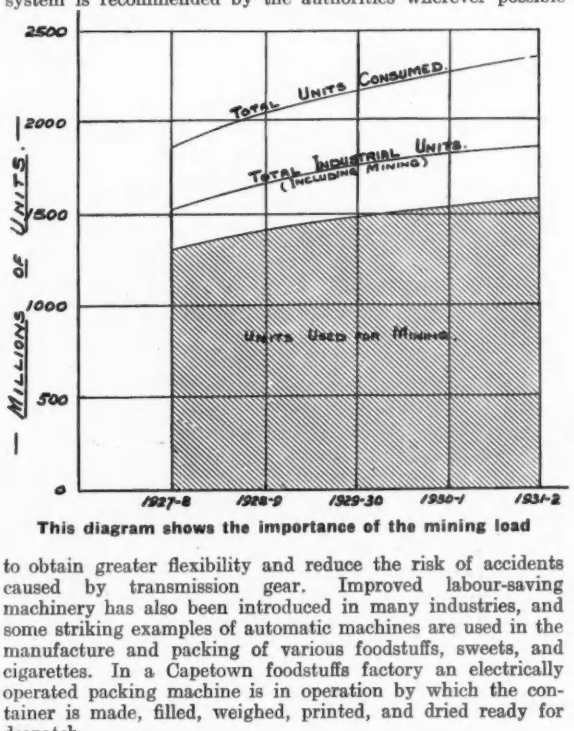
The South African Power Load. By E. C. Klopper

Steady progress in industrial electrification

THE spectacular growth of the domestic load has probably to some extent overshadowed the quiet progress which is being made by electric power in industry, the importance of which is now generally appreciated alike by the supply authority and the plant manufacturer. The marked progress that has already been made is shown by some recent installations, such as the electrification of a portion of one of the large sugar mills in Natal.

A 2,000-kW turbo-alternator set has recently been installed which supplies current to three 350-h.p. variable speed commutator motors coupled to crushers through reduction gearing. The range of speed regulation is from 320 to 495 r.p.m. This plant, which is giving excellent service, represents an innovation in sugar milling in this country, and the motors are said to be the largest of their kind in the world. At a cement works new plant has been brought into use, including a 3,000-kW geared turbo-generator, two Babcock & Wilcox boilers, a 400-h.p. slurry mill, and a 400-h.p. cement-grinding mill.

Although until recently retarded by financial conditions, marked progress continues to be made in the modernisation of many existing plants. An increase in the use of independent motor-driven machines, particularly in the boot and shoe and woodworking factories, is reported. The adoption of this system is recommended by the authorities wherever possible



This diagram shows the importance of the mining load

to obtain greater flexibility and reduce the risk of accidents caused by transmission gear. Improved labour-saving machinery has also been introduced in many industries, and some striking examples of automatic machines are used in the manufacture and packing of various foodstuffs, sweets, and cigarettes. In a Capetown foodstuffs factory an electrically operated packing machine is in operation by which the container is made, filled, weighed, printed, and dried ready for despatch.

The extent to which Capetown has developed as an industrial centre is evidenced by the sale during 1933 of no less than 26 millions (out of a total of 106 millions) kWh for industrial purposes, exclusive of supplies to the Railway Administration for the Salt River and Harbour Works and of sales for traction. The rates at which electricity is sold for industrial purposes have for many years been such as to bring about practically the complete elimination of any other form of motive power, even in such cases as woodworking plants, where waste products were formerly used for power production.

The principal industrial centres comprise the coastal cities of Capetown, Port Elizabeth, East London and Durban, and the more important inland centres of Johannesburg, Germiston, Vereeniging and Pretoria. In Johannesburg, of the 77 million kWh sold to private consumers in the year ended June 30th, 1933, 24 million kWh (31.2 per cent.) was sold to industrial consumers, and during the year the motor load increased by 2,632 h.p. In Durban the past year's industrial consumption totalled 24,932,476 kWh, 23.4 per cent. of the total. Port Elizabeth (the Liverpool of South Africa) is equally progressive. Allowing for the depressed conditions during last year, kWh sold and power totalled 18,394,304, bringing in a revenue of £71,214. The Electricity Department has now approximately 260 power consumers whose installations aggregate nearly 15,000 h.p. The Department has recently entered into negotiations and contracts which within the next year or two will bring the maximum demand on the station to 14,000 kW and further plant extensions approved by the ratepayers will bring the installed plant capacity at the power station to approximately 36,000 kW.

Pretoria has a large number of industries, the majority of which employ electricity derived from the City Council's electricity supply system; for the last complete financial year, 19 million out of a total of 39 million kWh was sold to industrial consumers. With the commencement of production by the new iron and steel and subsidiary industries in this centre, Pretoria should soon have the biggest industrial load of any municipal undertaking in the country. Another rapidly growing supplier of industrial power is the Electricity Supply Commission, which last year sold 67,000,000 kWh for industrial purposes.

The Mining Load

The industrial loads of the municipalities are, however, collectively entirely overshadowed by the heavy consumption of the Witwatersrand Mines, to meet which a new 100,000-kVA plant is to be erected immediately to augment the supplies from the existing power stations at Brakpan, Rosherville, Simmer Pan, Vereeniging, and Witbank; in addition the E.R.P.M. and Randfontein stations are being extended. The accompanying graph shows the relation of the mining consumption to the total. Indeed, had it not been for electricity the industry could never have achieved so high a degree of development. Every department of the mines on the Rand uses electrical energy for purposes such as pumping, winches, tramming, winders, workshops, reduction plants, lighting, &c.

The use of power on these goldfields is of great significance in connection with the economic life of the fields. In a week of 168 hours the load is for 144 hours, at least on the new mines, and there are hardly any seasonal variations, as with domestic loads. Other twenty-four hour loads include electrochemical works, flour mills, and cold storage. Railways have loads distributed over only fourteen to fifteen hours, with a very marked maximum twice a day, so that about three-quarters of the energy taken is required within four or five hours of the twenty-four. If the large industrial loads did not exist power for domestic purposes would be very much more expensive than it is.

Brush-gear and Rotary Collectors.

By F. G. W. Tree, Assoc.I.E.E.

An investigation into design, effects, and losses

THE demands upon rotary machines call for efficient and reliable brush-gear and collectors, but often in practice these are the weakest components. The following investigations are the outcome of experiments and tests carried out on six distinctly different machines, varying in capacity from 500 to 2,000 kW.

The varied design and characteristics of brush boxes show that opinions differ as to the structure and assembly necessary for effective operation. Some boxes enable brushes to move both radially and axially; others are so flimsy that movement of the rotary surface—collector ring or commutator—causes the box and brush to vibrate.

Although it is permissible to allow clearances of 0.012 in. to 0.002 in. and 0.007 in. to 0.0001 in. axially and radially, respectively, particularly in the direction of rotation, there is no occasion for clearances greater than the minimum. This is of particular importance where boxes are not very deep, and a small radial movement is sufficient to make the brush tilt thus, causing it to operate at a higher current density than normal; a spark even during the initial run of a machine may puncture the rotating surface to an extent sufficient to create a pit, and the effect is thereafter cumulative.

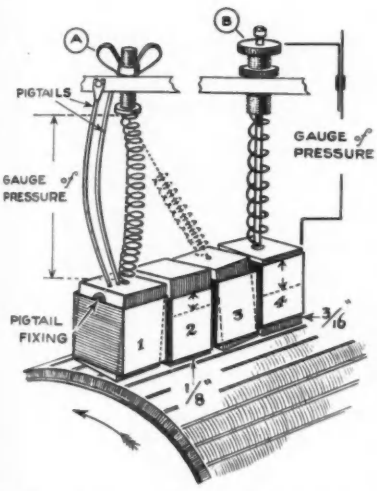


Fig. 1.—Exaggerated examples of tilting, spring bowing and axle wear

The purpose of the oscillatory movement common in modern machines is to keep the collecting surfaces axially even, yet, whether ridges exist or not, once sparking occurs the wear on the surface and the brush is greater than it would be without the movement. Tests have disclosed that, on a commutator which is axially stationary, a spark may remain at one point on a brush face, and its effect upon the commutator is confined to one circumferential track. If the commutator oscillates, the spark travels in the direction of movement and is concentrated on the same track as previously, so that the rotary surface does not wear evenly over its entire area. In addition, the uneven surface resulting from sparking and copper lifting causes the brush to lift or tilt, and the general effect is intensified. Oscillatory movement is beneficial only so long as the condition of the rotary surface and brush is even and unaffected over its entire area. In practice, even when abrasive brushes are used, it is futile to attempt to "stone" a rotary surface by oscillatory movement.

Individual Adjustment

Axial staggering of brushes is superior to oscillatory movement, and the total wear may be considerably less if there are an even number of positive and negative brushes on each track. If the boxes can be adjusted individually, it is a simple matter to position each box the required distance from the rotary surface, but in some methods of fixing the boxes are part of the brush arm structure, and unless the arms are so fixed that the box setting remains permanent, individual boxes on any one arm may be at different distances from the rotary surface. A difference as much as $\frac{1}{16}$ in. was observed on several machines in the course of these investigations, and the brushes were working at an angle of some two degrees from the vertical; this means a loss of brush material to the extent of $\frac{1}{32}$ in., equivalent to about 200 hours per brush.

The pressure on a brush tilted axially or radially is not evenly distributed over the entire brush area, and this may result in a considerable variation in the contact drop of some grades of brushes. Therefore, apart from effects upon friction, temperature, current density, and so on, a brush having unevenly distributed pressure means excessive wear and commutation troubles. If the leading or trailing edge is off the commutator, the effect is similar to that of faulty alignment, but commutation has to take place in a much shorter time. While the normal brushes take most of the load and commutation duties, the brushes that are in partial contact operate at a higher density and spark.

Exaggerated examples of tilting, spring bowing and angle of wear are shown in fig. 1, together with uneven alignment of boxes, and free spring and guide stem pressure arrangements, A and B. The diagram shows: (1) Tilt of brush due to spring bowed radially. (2) Tilt of brush due to spring bowed axially. (3) Brush higher in box, which is nearer to commutator. (4) Brush lower in box, which is higher and out of line radially.

The normal life of a brush one inch in length is from about 10,000 hours upwards, according to grade, and the average is about 13,000 hours, but many conditions reduce the life sometimes to less than half that figure. The life of a brush depends upon the amount of its usable and not its overall length. About 25 per cent. of some brushes is absorbed in fixing pig tails, but in others it may be much more. On machines having 100 or more brushes this loss is considerable, and the cost of replacements may be doubled. The use of pig tails fixed with metallic "cement," or compressed into the brush material during manufacture enables $\frac{1}{8}$ in. to $\frac{3}{8}$ in. more brush to be used.

Unless the guide-stems of pressure springs and pressure adjustment screws are of sufficient length, the maximum life cannot be obtained. Even a $\frac{1}{16}$-in. short stem or screw may decrease the life of a brush by 500 to 1,000 hours, according to the brush grade, and this loss may amount to 15 to 25 brushes every 10,000 hours. On one 1,500-kW machine, having a total of over 200 brushes, fully $\frac{3}{16}$ in. and $\frac{1}{4}$ in. of each a.c. and d.c. brush, respectively, could not be used, due to short adjustment screws and pig tails. The a.c. brushes had too little pressure when the wear reached a certain point due to the springs being unsuitable, equivalent to a total loss of 75 brushes. Fig. 2 shows a 1½-inch brush (electro graphite, at 5,500 ft. per min.), losses due to methods of fixing pig tails, hours running and output per length of brush.

Spring Form and Material

The design and materials of springs have a large bearing upon the life and operation of brushes, yet on some machines scarcely two springs are alike. Some springs are excessively elastic, while others are so powerful that $\frac{1}{32}$ in. compression gives 1 lb. pressure. In consequence of this, apart from difficulty of adjustment, after only 150 to 200 hours' wear on each brush the pressure may vary from 4 oz. to 1 lb. less than normal, according to the nature of the springs.

Spiral springs suffer from a greater loss in pressure than do clock-type springs during a given period, and so should be constructed to give not more than 2 oz. per $\frac{1}{32}$ in. compression, though, of course, they should not be unduly flexible. On one type of brush-gear the thin wire compression springs bowed radially or axially, the pressure being uneven and not directed upon the correct point on the brush.

The use of a guide stem tends to prevent bowing, but, unless the stem can move freely within its support, the pressure adjustment is sluggish, particularly when iron and steel stems are used. Non-corrosive metal stems are advantageous, so long as their softer nature does not result in the stems becoming unduly worn and loose in their supports.

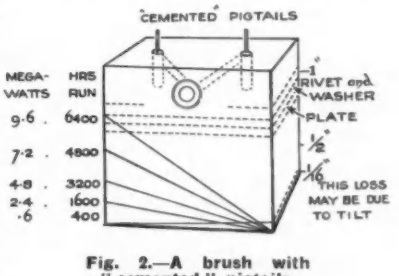


Fig. 2.—A brush with "cemented" pigtails

The rate of wear of the various grades of brushes depends largely upon the peripheral speeds to which they are subjected, and on some machines the life of a brush may be twice as great as that of the same grade on another machine. Besides the loss due to friction, those losses and effects characteristic of various speeds must be considered. For instance, up to about 8,000 per sec. the movement tends to lift the brush off the rotary surface, and the leading edge suffers most. Unless the pressure and the arc of contact are maintained, unequal contact drop and current density, excessive copper picking, and unnecessary wear occur.

The arc of contact must be maintained against peripheral speed and uneven surface, and to some extent tandem brushes

enable this to be done, but they do not show an improvement over single brushes when the uneven surface is circumferential and in the form of ruts and ridges. Indeed, apart from any electrical aspects, the tandem arrangement complicates brush-gear, but the small area of the brushes used enables finer springs to be utilised, with consequently more consistent pressure.

Wear may amount to 10,000 revolutions per year of running. To be really beneficial, of course, there must be an equal number of positive and negative brushes on each unit area of the rotary surface, to enable the copper-picking effect to be evenly distributed over the entire surface of the commutator.

On machines having many brushes, the problem of maintaining correct pressure is a physical and electrical one. At any given pressure the current per brush largely determines the rate of wear. The contact surface may be halved, as the result of improper bedding, and thus the current density and wear are increased.

The testing of pressures by hand-pull has been the direct cause of many troubles and much expense. The spring balance affords an accurate check when it can be applied, but it is not always convenient to use a balance. Testing the pressure by the current flow in pigtails by an inductor ammeter is not always possible, and stray fields often render results unreliable.

A Pressure-testing Device

A reasonably accurate and easily applied device, giving a constant check, is an adjustable steel gauge which has been in constant use on twelve different types of brush-gear during the past twelve months. The gauge measures the distance between the top of a brush and a point on the adjustment gear, so that the wear shows the adjustment in pressure required. It may be applied to measure the length of spring compressed for a given pressure, and the extent of the brush wear permissible is given on a scale on the gauge part which follows the brush into the brush box. The gauge is only accurate when boxes are set in like positions, springs are of uniform design, and compression features and conditions are standard on any particular machine.

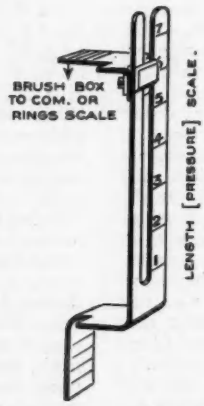


Fig. 3.—The scale for gauging permissible wear

The scale for gauging permissible wear in order to prevent pigtails from coming into contact with the rotary surface due to brush wear is shown in fig. 3.

A.c. and d.c. brushes are generally subjected to 3 and 2 lb. per sq. in., respectively, but opinions differ as to the advisability of grading pressures according to the circumferential position of brushes. Since the weight of a brush may vary from 2 oz. to 1 lb., a brush the weight of which assists the pressure spring makes more intimate contact. Therefore, on machines having top and bottom brushes some 120 to 180 degrees apart, the pressures should be so adjusted that each brush has the same contact with the rotary surface.

Troubles are often wrongly attributed to soft, uneven, or non-homogeneous surfaces. A non-circular surface may be responsible for the formation of ridges and ruts from the time of the initial run. Commutators and rings are remarkably consistent in respect of their strength and materials, but some compositions are more readily affected by adverse conditions. Even when an abrasive brush is used on a rotary surface, the wear on the surface should not exceed 0.01 in. during 7,000 hours, but even surfaces need grinding within 10,000 hours.

Ruts and ridges to the extent of at least 0.25 in. wide and 0.001 in. deep have been observed, besides considerable burning and blobbing of metal along the axial edges of segments. Excessive and uneven wear may be due to brushes overlapping the a.c. rings during oscillatory movement, and this points to the need for brushes slightly narrower than the rings. In any case, the oscillatory movement and the width of the brush must enable the wear to occur evenly over the entire width of the ring.

The Position and Span

On some machines even wear is not possible, and on others, excessive oscillatory movement is necessary to obtain even wear. Once a ridge or uneven wear is in being, copper-picking and excessive brush wear are considerably increased. The position or span of a.c. brushes in respect of copper-picking is of importance, yet we find some machines have spans which give entirely different effects from those on others. Whether the brushes are positioned to a two-pole pitch, a third, or a half the circumference of a ring, the copper-picking due to current flow from the rotary surface to the brush should be equal on each unit area throughout revolution. This applies equally to d.c. brushes. If not, uneven wear is inevitable.

The lift depends upon the current frequency per revolution, the current density, and size of the rotary surface. Thus the span of the brushes on a.c. rings must enable each unit area of each ring to be positive an equal number of times. On some machines the span appears to be too small or too great and the number of brushes is excessive. Apart from the number required for normal current density, one or two brushes too many on an arm can make all the difference in the matter of copper-picking. Absolutely even wear is not wholly obtainable in practice, but some brush arrangements produce excessive irregularities. On some rings the brushes show no rise and fall or wobble after 15,000 hours' running, but those on other machines have a decided movement, the frequency of which is high and the amplitude small, but unless the brushes are able to follow rapidly the undulations, still greater copper-picking and wear result.

A large number of small brushes is preferable to a smaller number of large ones. Compression springs usually enable the brushes to adjust themselves to surface variations more than other types of springs, but guide stems may result in undesirable effects due to vibratory movement. Flats and ridges give rise to low-frequency high-amplitude movements, while, as distinct from circumferential unevenness, axially uneven surfaces on oscillatory rotors cause high-frequency high- or low-amplitude movements, according to the extent of the surface damage. A free spring tends to follow the movement of the brush more easily, in that the end is free to remain in touch with the brush, but a spring having a guide stem is more likely to jump off the brush as the result of the uneven surface. The effect of the jump is similar to that of a hammer, and the repeated blows which may occur cause a physical as well as an electrical disturbance.

Some rotary surfaces, particularly those having wide axial areas, show a tendency to wear most in the centre tracks, while the innermost and outermost tracks remain more or less level and unworn. This appears to be due to uneven heating caused by air currents from the rotor, so that the inner and outer tracks are cooled more than the centre ones. With composite brushes particularly, the higher temperature results in the centre track brushes carrying more current and lifting more copper than the remainder.

Electricity Supply in Japan

THE Electrical Association of Japan, Tokyo, has issued, through Messrs. Mitsu & Co., London, an 18-page booklet in English giving an outline of progress and the position of the electrical industry in that country. The electricity supply industry in Japan dates from 1887. At the end of 1932 there were 850 public service undertakings (including 173 for traction only) and 6,870 private plants (including 363 Government owned). The generating capacity of the first group was 4,275,000 kW, while a further 1,736,000 kW was under construction, and of the second group 658,000 kW with 130,000 kW under construction. Of the total of 6,799,000 kW, 4,532,000 is hydraulic, 2,198,000 steam, and 68,000 oil. Water power available at 2,822 sites is estimated at 6,415,000 h.p. minimum flow and 14,090,000 h.p. maximum based on six months' flow; the annual average is 11,933,000 h.p.

During the first ten years or so several water power plants with from 100 to 250 miles of 154-kV transmission lines to the nearest load centres have been completed, the most prominent of these undertakings are the Daido E.P. Co., the Nippon E.P. Co., and the Tokyo E.L. Co. The number and h.p. of motors installed in 1932 were 566,000 and 3,834,000, of which 405,000 motors aggregating 1,341,000 were served by public utility undertakings. Energy was used for other purposes in industry and in the household to the extent of 930,000 kW, four times the amount in 1923, due mainly to growth of domestic electrification. About 3,700 miles of railways are electrified, compared with 600 miles just before the war. The total investment in electricity supply exceeds five thousand million yen.

The production of electricity in 1933, according to the *Financial News*, was 17,000 million kWh, of which 14,700 million kWh was derived from water power; the output for March, 1934, was 1,148 million kWh. The same report states that the Japanese Power Federation, which had been charged by the Government with the duty of reporting on the unification, co-ordination and better distribution of electricity, had recommended that a large constructional programme should be put in hand under Government auspices. The industrial consumption in 1934 amounted to 5,000 million kWh, the major portion of which was allocated as follows: Spinning, 600; rayon, 250; fertilisers, 1,700; chemical, 400; metallurgical, 6,000; coal mining, 520; cement, 200 (million kWh).

Hospital Electric Kitchen Equipment

Features of Swiss and Irish installations

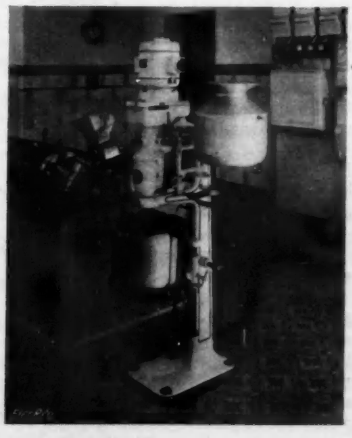
COAL-FIRED cooking plant at the Samaritain Hospital, Vevey, Switzerland, has been replaced by electrical apparatus. The responsible authority decided to take this step after enquiring closely into the respective merits and disadvantages of cooking by gas and electricity, and after visiting the hospitals at Zurich, Liestal, Rheinfelden and Aarau, where electric cooking has been in use for many years past. Factors which influenced the decision were the cleanliness and absence of fumes afforded by electricity and the attractive rates at which supplies of power were offered by the Société Romande d'Electricité.

Left: The kitchen of the Samaritain Hospital, Vevey, Switzerland. Right: A Dublin hospital kitchen

A contract was placed with the Société Kummler & Matter, of Aarau, for a complete installation sufficient to provide meals for from 150 to 180 persons. The plant installed comprises a cooking stove with four 2,500-W 12-in. round boiling plates, three 1,800-W 8.66-in. plates, two 4,000-W square plates about 18¼ in. by 18¼ in., and a 3,000-W oven with sliding doors. All the boiling plates have four degrees of heat control, the total load of the stove being 26.4 kW. There is also a 16-kW three-compartment cooking and roasting oven mounted on a non-heated cupboard, a tilting 7½-kW cake-making and roasting stove and three open-top tilting kettles, one having a capacity of 16¼ gallons and the other two of 11 gallons each. The loading of the three kettles is 24.5 W, and the total load is 74.4 kW.

The stoves and other appliances are externally finished in a blue-grey enamel, with nickel-plated fittings. The kettles, which can be tilted for pouring by hand wheels, are of a new high-efficiency type with heating elements acting by radiation. They are mounted together with the switch control gear, indicating lamps, and a cold and hot water mixer on a shelf along one of the walls of the cook-house. Each kettle is provided with seven different degrees of heating.

The installation, which has been operating for the past few months, is stated to have proved entirely satisfactory in every respect. It was estimated that the power consumption would amount to 1 kWh per person per day, whereas in actual use the consumption has worked out at only 0.6 kWh. Taking a daily average of 1055 people, the cost of power works out at only 4 fr. per day (about 3s. 2d. at 25 fr. to the £), a lower figure than was attained at any time with coal.



An electrical mixer with special food attachments at the Dublin hospital

A Dublin Example

A particularly neat kitchen—put into service recently by the Jervis Street Charitable Hospital, Dublin, serves the College of Nursing attached to the hospital, and upon its performance depends the conversion also of the kitchen in the hospital itself. Mr. Ralph Byrne, M.R.I.A., was responsible for recommending the use of electricity, and also for retaining Mr. Arthur E. Porte, M.I.E.E., who managed the first telephone company and the first public electric lighting company in Ireland, to advise the Hospital Board upon all electrical matters.

In order to secure daylight for the surrounding buildings, it was necessary for the architect to curtail the height of the kitchen. This would probably have produced undesirable working conditions with other than electrical apparatus, but as it is, even during the hot weather that has been experienced, the kitchen has proved to be delightfully cool and free from cooking vapours. In the winter months the efficient lighting will be an added advantage.

The general view of the kitchen reproduced on this page shows all the apparatus except the potato-peeler and the dish-washer. This equipment includes a mixer, a hot cupboard with hot table-top, a single pan fryer, an island range with two ovens and eight boiling plates, a bread and meat slicer (seen behind the range), a group of stock pots, an urn and a grill.

The mixer is shown separately with one of the special food preparation attachments in position and others on the table. The clock in the background of this picture is electric. Each of the four stock pots has a capacity of 7 gallons and is loaded to 6 kW on three heats arranged by phase connections, the elements being housed in the rectangular water sump under the pots. The jacketed pots tilt on trunnions, and are constructed internally of seamless "Uirosta" metal (Austenitic nickel-chrome steel, which not only resists oxidation but is inert to acids and alkalis at cooking temperatures). Each pot is fitted with a filler, pressure gauge, test cock and spring-loaded safety valve. The 11½-gal. urn is loaded to 6 kW with 3-phase heat control, the griller has an area of 16 in. by 12 in. and is loaded 4 kW with three heats on 1-phase.

Each oven in the range is 16 in. wide, 12 in. high, and 28 in. deep, with top and bottom heating. Four of the boiling plates are 12 in. diam. and four 8¼ in. The total loading of this range is 23.2 kW. The fryer is 18 in. by 18 in. by 10 in. deep and has a vented canopy. It is loaded to 7.5 kW with 3-phase 3-heat control. The hot cupboard is loaded to 4.5 kW, and is 6 ft. long by 2 ft. 8 in. wide.

The dish-washer is of the café type made by Krefft, and will take the largest plates. It is loaded to 6 kW.

The potato peeler, which has an output of 60 lb. in five minutes, was made by the Alexanderwerk A.G., Remscheid and London, who are also the makers of the mixer. It is driven by a built-in water-tight 3-phase 1-h.p. motor.

The kitchen which has been designed to cater for about 150 people, is proving admirably suited to requirements. The whole of the electrical equipment was supplied by the Irish Free State Electricity Supply Board and the wiring contractors were the Bective Electrical Co. (Ireland), Ltd.

Electrolytic Zinc Plates. By C. C. Downie

ZINC plates for process engraving, which appear to be the only type of high-class zinc in demand, have hitherto normally been made by rolling out ingots of the pure metal and then subjecting them to sandblasting or chemical treatment to impart the desired surface, but recent researches have shown that they can be made by electro deposition. By the mechanical process, the zinc is rolled in moderately thin plates in stock gauges (B.w.g.), according to the superficial dimensions of the plate. This zinc is liable to break (even if only at the surface) when bent on the bedplate. Its advantage over aluminium in general workshop practice is that it is but slightly affected in ordinary air.

[Jerome, Ltd.
Mr. C. C. Downie

The inability of polished zinc to retain moisture evenly on the surface makes it very difficult to work, and this gave rise to sandblast graining by specially constructed machines, which cut minute pieces out of the plate while the general surface of the metal retains comparative evenness. As an alternative, chemical treatment can be applied; this imparts a surface eminently suitable for either direct drawing or transfer work. The grain so produced can be either extremely fine for direct photo-printing, or of any degree of coarseness down to that required for bold chalk drawing for poster work.

Electrolytically deposited zinc is of a purity hitherto unknown (up to 99.8 per cent.), and possesses different physical qualities from that of the cast or rolled metal. Brittleness, which is largely due to impurities, is almost eliminated. No lead is present, while the existence of iron to the maximum content of 0.2 per cent. associated with ordinary cast zinc is practically impossible. Copper and antimony are completely eliminated before electrolysis commences by immersing in the solution metallic zinc. This removes all base metals from the zinc electrolyte except iron, which is precipitated by any hydrated zinc salts formed before passing into solution.

The System Explained

Process engravers' plates can break and bend in a variable manner irrespective of the purity of the zinc, but this is due to the rolling having aggravated the previous condition of the metal, the annealing being simply a rectifying measure to relieve the strains in the crystalline structure. Had it not been necessary to roll and mechanically treat the zinc in making the plates, such heat treatment would largely have been unnecessary. The conditions of casting the original ingot may also introduce strains in the metal. Electrolytically deposited zinc plates are made in much the same manner as copper sheets for different industrial purposes. Briefly, the plant consists of a number of lead-lined vats charged with a solution of zinc sulphate made by dissolving the crystals in water. The usual proportion is 8 per cent. of zinc sulphate with sulphuric acid. As the temperature and acidity of the electrolyte are directly responsible for the fall of voltage, and as high temperatures are not desirable, the acidity decides the voltage to be employed.

Cathode plates are suspended by connecting rods in the vats, and eccentrics on shafting above cause the cathode plates to oscillate at the desired speed. This oscillating or reciprocating motion causes the zinc to be deposited as a flat surface. Vertical paddles ensure that the zinc-sulphate electrolyte flows over the surface of the cathode plate with absolute regularity. The electrolyte is kept in continuous motion, apart from this, and caused to pass through a filter which removes any impurities that may separate out. The thickness or the nature of the surface of the plate may be modified at short notice by altering the rate of circulation and the current density.

The formation of zinc sponge has done much to retard the development of this work; instead of the deposited plates having a sound metallic surface, there appear to be small amounts of zinc oxide or basic zinc salts which give the product an artificial appearance. When the surface becomes irregular hydrogen over-voltage may fall appreciably, but this does not matter to the process engraver.

What is desired is a means of controlling the grain of the surface, and the electrolytic system holds great possibilities in this direction. The work is not simple, since any interference with the hydrogen-ion discharge can do more than prevent a smooth deposit. Carelessness can cause the plates to be deposited in a loose, voluminous, and dark condition, which is the reverse of what is wanted. The usual corrective measure is to increase both the acidity and the current density. When first tried a few years ago, the plates themselves could not be properly deposited, let alone the surface, and a great amount of research work was necessary. One tendency is for the zinc to be deposited more richly at the edges of the plates, and hence to make them uneven. A thin plate has, therefore, to be made with great care, so that not only is it comparable with the rolled plate but its surface can be completely kept under scientific control.

Deposition of Zinc

The deposition of zinc under the best scientific conditions resembles the freezing of molten metal. Crystallisation begins at a number of centres, and spreads outwards from each. When no solid matter is present, a liquid experiences some difficulty in starting to crystallise. Even a minute particle of solid matter within the liquid acts as a nucleus upon which the first small crystals are deposited. Such is the case with zinc, and once a crystal is formed in the liquid other crystals are deposited upon it, usually with the same orientation as that of the first.

The tiny crystals adhere to each other by their corners, or less frequently by their faces, in such a manner that the directions of their corresponding axes throughout the growing mass are parallel. The growth therefore takes place chiefly in the directions of the crystalline axes, or bears a definite relation to them. The different ways in which this process is interrupted give rise to the vast series of crystal structures. With the crystallisation of molten zinc, there is no means of arresting or controlling the growth until the whole has solidified. With electrolysis, however, the amount of metal deposited is directly controlled by the current density or the resistances set up. Manipulation of the conditions and current can cause the deposit to display different crystalline structures.

What future possibilities will accrue from this remain to be seen, but there are two features of the mechanical methods more generally employed which must have attracted the attention of the process engraver before now: first, the rolling of the plates impairs the crystalline structure and necessitates heat-treatment to rectify the weakness; second, the plates are subjected to chemical treatment to accord to them the desired surface. That is, the outcome of the rolling process is a product which has neither the physical nor surface conditions desired, and measures have to be subsequently applied to obtain these. With the electrolytic process of deposition, no rolling is necessary, and the degree of coarseness of surface is controlled by the current and acidity. Thus, instead of preparing a zinc plate in a manner which necessitates two different treatments to bring it to the desired condition, it appears to be possible to make the finished product in the one operation.

British Industries House Medical Section

THE Earl of Derby recently opened the Medical Section of British Industries House, Marble Arch, the permanent demonstration centre organised to develop the trade of the Empire.

The section comprises a comprehensive display of British-made hospital, medical, and surgical requirements and also a twelve-bed ward, two operating theatres, and several accessory rooms. This unique demonstration, equipped with the latest scientific appliances and approved methods of furnishing and maintenance, has cost several thousands of pounds. It forms an up-to-date hospital suite on the ground floor of British Industries House and was constructed from the plans of Messrs. Adams, Holden & Pearson, who are responsible for the new Westminster Hospital. The Empire materials used have been specially selected with a view to standardising construction and to show the most economical and practical method of hospital building.

The ward has, at one end, a semi-circular sun balcony for convalescent patients and there are rooms for the staff and storage. The larger operating theatre, 24 ft. by 20 ft., is equipped with all appliances needed for major operations. Adjoining are a clinical laboratory, surgeons' rooms, sisters' room, anæsthetic department and a minor operating theatre. A doctor and technical experts are always present to explain the buildings, equipment, and the furnishing.

On the third floor there is also a range of British-made requisites for the science of healing, and on the lower ground floor will be the manufacturers' pattern and sample department for showing commodities needed by the lay side of hospital maintenance.

Correspondence

Correspondents should forward their communications as early as possible. No letter can be published unless we have the writer's name and address in our possession

Rural Supply at Whitby

In your issue of July 20th, page 97, there appears a paragraph with a sub-title "Whitby—No Rural Supply Yet."

This paragraph is misleading, as the Whitby Urban District Council is already supplying the villages of Sandsend, Sleights, and Robin-Hoods-Bay, which are in the Rural District Council's area. The Rural Council has asked for a supply to the village of Hawsker, which consists of about twenty scattered houses, the majority of the small cottage type. Only three actual enquiries for a supply have emanated from this village, and to give a supply would mean tapping a h.v. line at two points owing to the distance apart.

My Council has spent over £10,000 on rural electrification, and the number of consumers connected to date since commencement of the supply in 1932 is 332 in the three villages, representing an income of £1,667.

There is no industry of any description in the area.

J. W. PIGGOTT, *Electrical Engineer*,
Whitby, *July 23rd*. Whitby Urban District Council.

The Consumer and the Industry

At the end of her interesting article on "Efficient Electric Cookers" (ELECTRICAL REVIEW, July 27th, page 116), Miss Ester Purvis remarks that it may fall to the lot of a consumer some day to instruct the industry. Can it be, then, that manufacturers are not paying heed to everyday experience?

In my opinion many consumers are qualified to give extremely useful advice to the makers of appliances and to the electricity supply authorities themselves. Householders are not all fools; thousands of them have had all kinds of "working" experiences with cookers and other appliances which they are quite capable of passing on to any receptively inclined supply or contractor representative. They are only too pleased to do this when they find that there is a disposition to treat their suggestions seriously and a desire to give helpful advice and improved service. I have known undertakings which have gained useful and practical hints through the visits of women canvassers and male members of the sales staff, who call with the definite intention of talking matters over with the mistress of the house or those who help to run her household.

Such interviews inevitably yield many useless and absurd notions which are unacceptable or impracticable, but every effort to see things from the consumer's standpoint is a good investment.

Without wishing to take part in the controversy of supply authority versus contractor, I may say that it is from the former that I have received assistance, though if both parties worked together amicably either should be able to pass the information on to the proper quarter, which I presume would generally be the manufacturer. P. R.

July 28th, 1934.

The Cooker and the Kettle

I have read the article on "Efficient Electric Cookers" in your issue of July 27th, and note with surprise Miss Purvis's depreciatory remarks on the use of the electric kettle as an adjunct to the electric cooker. The objection of high maintenance costs due to boiling dry is entirely met by the use of automatic safety kettles, of which there are many efficient and reliable patterns manufactured and in extensive use. Our own maintenance costs with such kettles over a number of years have been negligible.

In my view, an important reason for supplying an electric kettle with a cooker is the fact that, in effect, it is the practical equivalent of another boiling plate. The average electric cooker has fewer boiling units on the hob than the similar size of gas cooker—a point to which consumers often draw attention. The provision of an electric kettle, however, gives that extra unit which is necessary. A popular size of electric cooker is that which has one boiling plate and one boiler-griller; if, as is often the case, a kettle of water is required when either the boiling plate or both units are in use, it is inviting trouble to compel the consumer to wait or to move something aside. I know it will be said that several utensils can be placed on one electric boiling plate and that greater cooking capacity is thereby obtained. This is true to a certain extent, but in practice the different pans have usually to be brought to the boil or heated up alone on a single plate first of all.

The electric kettle should not require to stand on the cooker hob, as the space there is needed for the cooking utensils in use with the boiling plates. Our practice is to fit a small wooden shelf for the electric kettle close to the cooker. These shelves cost 2s. 6d. each, fitted complete—a small sum which is amply repaid in freedom from possible damage to the kettle or its flexible, while at the same time unrestricted cooking space on the hob is secured.

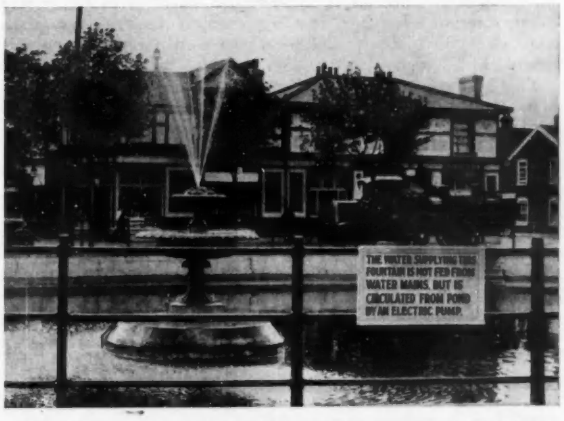
The electric kettle is deservedly a popular electrical appliance, appreciated by consumers alike for its speedy boiling, economy and convenience, and it is to our advantage to encourage its use, particularly in conjunction with electric cooking installations. W. K. FLEMING.

Rothesay, *July 30th*. *Burgh Electrical Engineer.*

Electric Vehicles: The New Phase

A good deal has been written from time to time about the anti-electrical bias of electrical engineers—their curious reluctance to become enthusiastic about the extension of electrical applications in new directions. This internal resistance in the electrical circuit is not so high as it used to be; nevertheless it persists. It leads electrical engineers to turn to petrol omnibuses as the alternative to tramways, without giving adequate consideration to the claims of the trolley bus. It accounts, also, for the fact that electricity supply authorities are frequently the last, instead of the first, people to adopt battery vehicles.

Many central station engineers seem to suffer from no sense of incongruity when they label their petrol delivery vans with such legends as "Electricity is Best for Everything,"



To refute suggestions that water is being wasted at the Thornton Heath pond the Croydon Corporation has affixed a board to the surrounding railings which, incidentally, is a good advertisement for electric pumping

and—this immediately over the exhaust—"Use Electricity—No Smoke, No Fumes."

On the other hand it is true that engineers who were once keen enough on battery traction found great, and sometimes insuperable, difficulty in persuading committees to buy an expensive vehicle in place of a cheap one, even though the figures showed that the total service costs would be lower in the long run. The high initial cost of the battery vehicle, together with necessity for providing elaborate charging equipment, was a really formidable obstacle which prevented battery traction making headway. Most of the vehicles on the road to-day are old stagers; battery vehicles never die, they do not even fade away, but human nature is so constituted that these virtues make no effective appeal in comparison with initial cheapness.

It is important, therefore, that electrical engineers should realise the change which has come over the electric vehicle situation—a change comparable with the evolution of the light, efficient trolley bus of to-day from the cumbersome early types. The modern electric delivery van is so much lighter and cheaper, so much improved in design, that the old arguments against battery traction can be regarded as scrapped. One can, for example, obtain a 10-12-cwt. chassis, complete with charger and 185-Ah battery and all accessories, for £180; this vehicle has a range of from thirty to forty miles and a speed up to fifteen miles per hour on the level. A smaller van, capable of carrying loads of five cwt. on a forty-mile round, costs £146 complete and, with energy at ½d. per kWh, runs those forty miles for 6d.

Broadly, the position is that prime cost is (in spite of the much smaller scale of output) on a level with petrol vehicle costs and that running expenses are materially lower. Charging has become so much simplified that it involves no

trouble at all, and the user enjoys all the benefits of battery traction—cleanliness, quietness, reliability, and so on—with economy and ease of operation thrown in.

Even the most exacting electrical engineer will be convinced, if he looks into the matter, that the industry has now produced vehicles which, if properly exploited, will sweep the field of short-radius many-stop urban deliveries. An essential preliminary, however, is that supply authorities should offer a reasonable rate for this useful off-peak load and should themselves use electric power for delivering electrical goods.

In his I.M.E.A. paper at Liverpool, Mr. Townley spoke of the importance of an efficient service organisation and recommended that small electric vehicles be used for consumers' service work:—"A number of types are now available in the 8-12-cwt. class and the silence and good appearance of these small vehicles is good publicity for the department and will help to develop the use of such vehicles as butchers', bakers' and milk delivery vans." PROTONIUS.

July 27th.

Circuit-breakers and Fuses

Replying to Mr. Statter's letter in your issue of July 27th, each of these two types of protective gear has its own individual pre-eminence. The circuit-breaker is most suitable when frequent overloads have to be taken care of, provided, of course, that it receives adequate maintenance attention. Unless the maintenance, which is somewhat costly, is taken care of, the circuit-breaker loses its high initial speed of operation, the rate of deterioration depending on the situation in which the apparatus is installed, damp and dust being specially injurious. Maintenance usually necessitates the opening of the circuit-breaker, resulting in the supply being interrupted, which is a very serious disadvantage when used on a distribution system where continuity of supply is essential.

The high rupturing capacity fuse of the non-deteriorating type shows to great advantage when used for short-circuit protection. The initial high speed of rupture is maintained throughout the whole life of the fuse, regardless of whether it is in a damp or dusty situation, and it can be relied upon to clear the fault quickly and avoid the trouble being reflected further back on the system.

Regarding the speed of rupture on an a.c. circuit, this is dependent on the power behind the fault. The greater the power the faster the speed of rupture. On a 500-V circuit with a short-circuit value of the order of 25,000 kVA a 500-A English Electric cartridge fuse will clear in little over a half cycle, say 0.016 second.

That the power behind the fault has a direct effect upon the speed of rupture was well established during a series of h.p. fuse tests carried out in a large steel works early this year. The conditions were as follows:—

Voltage.	Short Circuit kVA.	Rating of Fuse.	Duration of Short Circuit.	Maximum Current Recorded.
2,800	125,000	180 A	0.012 sec.	40,000 A

Replying to the query raised in the last paragraph of Mr. Statter's letter, the English Electric cartridge fuse is definitely discriminating. A 500-A fuse in series with a 1,500-A fuse when subjected to a short-circuit, would clear the circuit leaving the larger fuse intact. The speed of rupture of the two sizes, if tested independently, would not vary very much, the amount of variation depending on the power behind the fault. This discriminating feature with fuses in series is due to the difference in the thermal capacity of the respective fuse elements. For the same rate of current rise the larger fuse will have a sensibly longer pre-arcing period. If, however, the larger fuse only is short-circuited, the ratio $\frac{dI}{dt}$ will be greater, and the overall speed of rupture correspondingly reduced.

The 11,000-V fuse also possesses discriminating properties to a marked degree, as the following test shows, when fuses of different ratings were connected in series and subjected to short-circuit requiring a rupturing capacity of 125,000 kVA.

Test No.	Fuses in Series, Amps.	Result.
1	6, 10, 15, 20, 25	6 A cleared.
2	10, 15, 20, 25	10 A cleared.
3	15, 20, 25	15 A cleared.

Note: one set of fuses only was used throughout the tests.

THE ENGLISH ELECTRIC CO., LTD.
A. M. Pooley, *Manager, Fuse Gear Section.*

Stafford, *July 30th.*

High-head Water Turbines

There are six points in Mr. F. J. Taylor's article in your issue of July 20th upon which I should like to comment.

(1) At the Walchensee power station the 24,000-h.p. units only are Francis double discharge. The other four of 18,000 h.p. are twin-wheel impulse units each wheel being operated by two nozzles and driving single-phase generators for railway service. The adoption of impulse units was governed by the value of their flat efficiency curve.

(2) As far as I am aware the highest head Francis units are four of 36,000 h.p. each operating under a maximum of 1,000-ft. head at Bringhausen, Germany, and manufactured by Messrs. J. M. Voith.

(3) In the specific speed formula a slight slip has occurred: it should read $H^{\frac{1}{4}}$ not $H^{\frac{1}{2}}$.

(4) Francis units are not limited to 1,000-ft. heads. I have seen a design for a 100,000-h.p. unit for 2,630 ft. This was a series turbine inasmuch as there were two machines each dealing with 1,315 ft., but the first machine had to withstand the whole head.

(5) Many impulse machines are built with multiple nozzles. Messrs. Escher-Wyss have specialised in vertical impulse wheels where four or six nozzles are arranged round the periphery. It is merely a question of specific and running speeds. In this latter connection the limiting specific speed with a *single* nozzle is certainly not 9 but about 7.25 and even so the efficiency would be bad due to interference between the buckets. To achieve the efficiencies mentioned the value would have to be reduced to about 6 or 6.2.

Similarly, with a Francis runner the lower limit, determined by the minimum water passage to allow of reasonably steady flow and not too high friction loss, is about 13.5 and not 11, while for a good efficiency 18 or 18.5 is the limit.

(6) Vertical-shaft machines are mentioned as being common in the United States. Where a designer is faced with a varying tail water level he will choose a vertical unit because (a) he can lift his generator well clear of any flood danger line, and (b) he can avoid danger of blade corrosion by reducing his draft head so that under minimum tail water conditions he still does not exceed a given amount, which may not be possible with a horizontal unit.

American rivers are particularly liable to this trouble, hence the frequency of vertical units. European manufacturers, however, also very frequently adopt this design—as, for example, the Voith turbines on the Rio Esla.

H. A. SIEVEKING, M.Sc., A.M.I.C.E., A.M.I.E.E.

London, N.W.3, *July 25th.*

Mr. Johnstone Taylor writes: "With reference to Mr. Sieveking's comments on my article, there is really nothing to enter into controversy over here. As regards (1) it should have been made clear that the 18,000-h.p. sets are impulse wheels. I have noted the slight error in the specific speed formula (3). In the matter of comments (2) and (5), particulars of these machines were not available at the time I prepared my article. As regards (4), this is rather a matter of individual opinion, and in respect of (6) the paragraph in my article was not intended to imply that the vertical-shaft Francis turbine was mainly an American production."

Supply Change-overs

In his article on this subject in your issue of July 13th, Mr. E. L. Gethin appears to have overlooked the value of rectifiers for conversion purposes. I have been engaged in change-over work for a number of years, both actively on behalf of a corporation and also commercially, and have used "hot cathode rectifiers" as a solution to many problems.

Mr. Gethin mentions the difficulty presented in suiting speed requirements when substituting a.c. motors for d.c. ones. He even suggests in some cases the extreme course of replacing whole units of plant when suitable a.c. motors are unobtainable. I have always found the best way of dealing with these speed problems to be the installation of a suitable hot cathode rectifier, the d.c. output of which is perfectly satisfactory for operating the existing d.c. motors, without any adjustment whatsoever. These rectifiers are highly efficient (90 per cent. approximately), simple to operate, small in size, and inexpensive.

I have had satisfactory results from them when used in conjunction with d.c. motors incorporated in the following plant: Church organs, printing machines, meat-choppers, lifts, cranes, hoists, dental machines, and electro-medical apparatus.

In the case of wireless apparatus the valve-type rectifier, in many cases, forms an ideal change-over medium, one outstanding advantage being that consumer's apparatus is subject to no alteration, and any maker's guarantee that may be still in force holds good. J. R. E. BRAY.

Potters Bar, Mx., *July 30th.*

Electricity Supply Rifle League

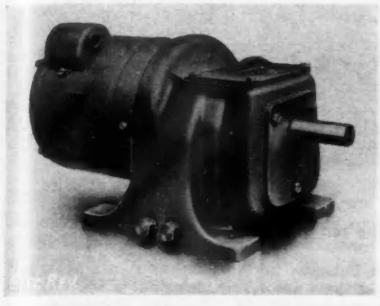
As a result of the June matches of the Electricity Supply Rifle League, the leaders of the four divisions are as follows:—Division 1, L.P. Co. "A"; division 2, City "B"; division 3, Brimsdown "A"; division 4, Fulham.

New Apparatus and Devices

for Domestic, Cooking and Heating, Lighting, Power and Scientific Purposes

Geared Motors

A range of geared motors has been introduced by CROMPTON PARKINSON, LTD., Bush House, London, W.C.2, covering both a.c. and d.c. machines from 1/3 to 30 h.p. The machines consist of a motor and gear designed to provide a compact driving unit of high efficiency and, in the case of a.c. motors, high power factor. Single, double and triple reduction units are available, giving a wide range of ratios with speeds as low as 13 r.p.m.



A Crompton Parkinson geared motor

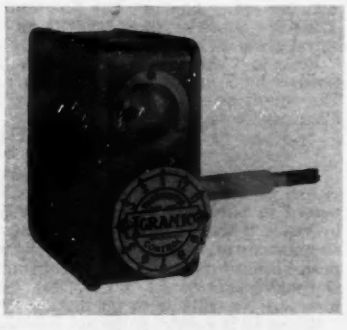
All units are built to standardised design, and parts are machined to gauges so that spares are strictly interchangeable. The motor is of the horizontal flange type rigidly bolted to the gear casing through a substantial machined and spigoted flange. The feet on the gear casing support the complete unit. A large inspection cover and oil-level indicator are fitted on the gear case, which is cast in one piece to eliminate any possibility of oil leakage.

In the case of fractional h.p. motors and the smaller a.c. motor units the bearings are of the ball type, while in the larger a.c. units and all d.c. models above 1 h.p. roller bearings are used at the driving end of the motor to carry the load of the gear drive, ball bearings being used at the opposite driving end and in the gear casing.

An Automatic Oven Regulator

Automatic oven temperature regulation has been for some time a powerful selling argument for certain types of gas cookers, and as a reply to this competition the IGRANIC ELECTRIC CO., LTD., Bedford, has introduced the "Thermentor" automatic oven temperature controller in two types, one suitable for attachment to existing electric cookers by a simple drilling and conduit fitting operation, and the other for building into cookers during manufacture.

The principle, construction and operation of the automatic regulator are simple. All that is necessary to ensure successful cooking is to set the numbered dial in accordance with a simple chart, and in the case of new cookers this automatically switches the oven elements on, while with existing cookers the usual switch needs to be manipulated.



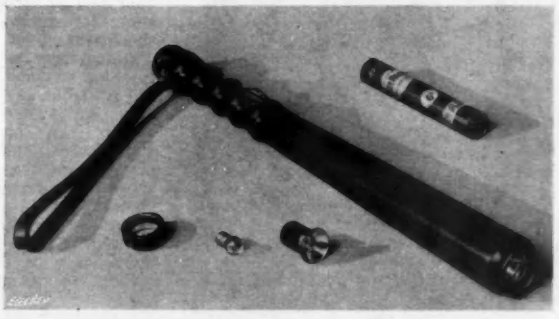
The "Thermentor"

A thermostatic rod projecting into the oven chamber is coupled to a substantial switch, which may be either built into the usual switch box or mounted in a neat enamelled case for fixing to the side of the cooker. The differential expansion of the rod and its surrounding tube of different metals provides the effort required to open and close the switch, which is capable of carrying continuously several times the rated load of 2½ kW.

Temperature regulation is effected by automatically switching off the oven elements when the internal air temperature reaches the required heat determined by the position of the knob, and switching on again at a suitable lower limit.

With the "Thermentor" a thermometer is unnecessary as an indicator lamp lights up when the oven has reached the desired cooking temperature, thus signalling the fact that the food should be inserted. The results are up to expert demonstration standard and, since only the amount of energy has been consumed that is required for maintaining correct temperature, there is an economy that should do much to encourage the extension of electric cooking. Definite proof of this economy has been shown by the Harrogate Electricity Dept., where two Jackson cookers were doing practically the same amount of work during the three weeks under review, yet the thermostatically-controlled oven consumed only 465 kWh of electricity, while the hand controlled model took 920 kWh.

For household use, the 2½-kW regulator is available for a.c. circuits with single-break contacts, or for d.c. supply with double-break contacts and condenser connections. A 5-kW model with double-break contacts is being supplied for larger cookers installed in hotels, institutions, &c. With regard to the cost of this appliance, prices are based on a quantity scale, and the chassis model ordinarily supplied to manufacturers cost about 14s. each in lots of 5,000 up to 19s. 6d. in batches of 50.



A truncheon embodying a flashlamp in the end, a recent product of the Ever Ready Co. (Great Britain), Ltd.

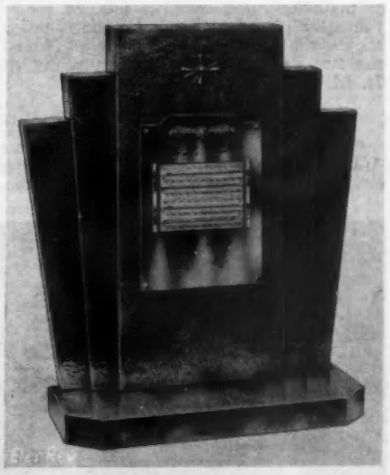
Combined Kettle and Egg Steamer

The latest introduction by MESSRS. BERKELEY & YOUNG, LTD., Tyseley, Birmingham, is a 3½-pt. kettle fitted with an egg steamer. It is constructed of heavy-gauge polished aluminium and is fitted with a 1,000-W "Chromalox" element incorporating a safety device which cuts off the current should the kettle boil dry. The egg steamer is placed in position by removing the lid, which is afterwards replaced on top of the steamer. The price of the standard kettle is 22s. 6d., the egg steamer being 1s. extra.

The B. & Y. combined kettle and egg steamer

A Car Battery Charger

THE EDGWARE MANUFACTURING CO., 32, Craven Park Road, Harlesden, N.W.10, has recently introduced a new car battery charger known as the "Radcar." The apparatus can be adapted to supply 2, 6, or 12 V, and runs off a.c. mains, 200/250 V, 40/100 cycles. The charger is fitted in a steel louvred case, finished in crystallised brown enamel, and is attractive in shape and appearance.

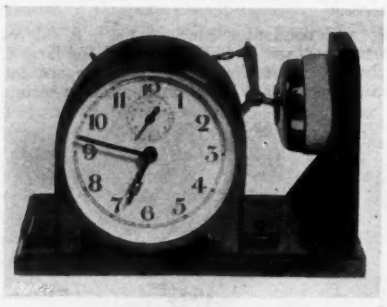


The "Monarch" panel fire priced at £6 10s. (2 kW) with a chromium inset and old pewter finish. It is made by Acelite, Ltd., Halesowen, Birmingham, and can also be obtained loaded at 3 kW or with black and chromium finish

Each main lead has a lamp fuse outside the case in a bakelite container. A Westinghouse metal rectifier is used, and a ballast resistance guards against damage in the event of the leads being reversed. Terminals are clearly marked, and a wander plug allows for the connection of 2-, 6-, and 12-V accumulators. For car use dashboard fittings are supplied.

A Simple Time Switch

A new low-priced time switch has been introduced by the S.F.P. ELECTRICAL Co., North Bar Works, Banbury, Oxon. It consists of a clock, the alarm mechanism of which is coupled to a tumbler switch, the latter being operated at the time for which the alarm is set. Various sizes of tumbler switches are available, and thus the time switch can be used for various purposes such as shop window lights, lamps over automatic machines, neon signs, displays, wireless sets, &c. A cheap model is available at 18s. 6d., and another model with a British-made clock and guaranteed for twelve months is priced at £1 5s.



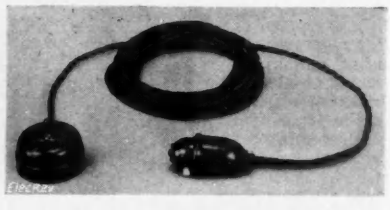
The "S.F.P." time switch

Motor-operated Valves

The DRAYTON REGULATOR AND INSTRUMENT Co., LTD., West Drayton, announces the introduction of a small motor-operated valve for hot-water systems, &c., similar in design to the large-type "O" valves, and known as type "P." The 15-W motor used is of the shaded-pole low-speed induction type, and prices range from £5 18s. for the ½-in. size with a single-beat valve to £11 10s. for the 3-in. size with a butterfly-beat valve. These valves are suitable for a.c. only.

A Two-way Switching Outfit

Various methods have been adopted for the control of bedroom lights from the bed, but few can claim to be neater or more simple than the new "Ezilite" two-way switching equipment made by the EZILITE SWITCH Co., 82, Broad Street, Teddington. The principle is exactly the same as that used for controlling a landing light from two positions, and fitting can be carried out in ten minutes.



The "Ezilite" switching equipment

Where a switch is wanted over the bed, that by the door is removed and replaced by a specially designed two-way tumbler switch connected by a length of triple flexible to a two-way pear switch over the bed. If necessary, the pear switch can be replaced by another two-way tumbler switch, so that, apart from its use in bedrooms, the apparatus can be employed for controlling passage or landing lights, for the remote control of mains-operated wireless sets, or for replacing any inconveniently placed switch. An examination of the equipment shows that both switches are of sound construction, and the two-way pear switch is unusually robust. The cost is 7s. 6d. complete.

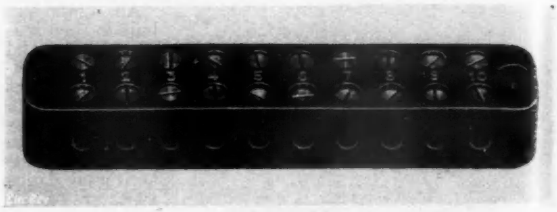
Pottery Table Lamps

Illustrated below are three unusual table lamps made by ALADDIN INDUSTRIES, LTD., Aladdin Building, Greenford, and having Crown Devon pottery bases. The type illustrated on the left (D.W.17) has a 9 in. shade in egg-shell vellum. Orange, salmon pink, blue-grey, green and cream colours are available. Type D.W.19 (centre) has a 10-in shade and a base coloured rose, black and gold, green, black and gold, or orange, black and gold. A 9-in. shade is fitted to model D.W.18 which is available in the same wide range of colours as the No. D.W.17 pattern.

Three Aladdin table lamps

A Ten-way Connector Block

We illustrate below a new ten-way bakelite connector block which has been introduced by MESSRS. ANDREW BRYCE & Co., Woodfield Works, Bury, Lancs. These blocks are particularly suitable for use with mains-driven radio receivers as they are made of bakelite with moulded-in brass insets. The screws are well sunk beneath the surface, and each socket is numbered. The dimensions are 4 1/16 in. long by 1 3/8 in. wide by ⅜ in. high, and the price is 3s. 6d. Another type which is similarly designed has six sockets; it measures 2¾ in. long and is priced at 2s. 6d.



A Bryce ten-way connector block

Multi-service Boiler-grillers

The latest addition to the "Ediswan" range of cooking utensils is a multi-service boiler-griller. The hob is of cast iron, vitreous mottled grey enamelled, and the oven is made of sheet steel, stove-black enamelled all over, inside and out, and is fitted with a door, a heat-insulated knob handle and feet.

A three-heat rotary switch is fitted on the right of the oven, and an aluminium reflector plate, drip pan and toast grid are supplied as standard. Two models are available; one, priced at £2 2s. 6d., has a 1,500-W open-type spiral element, and the other, costing £3 8s. 6d., has a 1,750-W "Reflecto" sheathed-wire element. Overall dimensions are: Grill, 9 by 7 in.; hob, 10 by 14 in.; oven, 12 by 9 by 7½ in. The suppliers are the EDISON SWAN ELECTRIC Co., LTD., 155, Charing Cross Road, W.C. 2.

The Ediswan "Reflecto" boiler-griller

Capacitor Motor Starters

The simplest type of single-phase capacitor motor has two stator windings, the main and auxiliary portions being connected in parallel across the supply lines, with the condenser in series with the auxiliary winding. For this condition the simplest form of starter suffices, such as the across-the-line push-button type made by the IGRANIC ELECTRIC Co., LTD., 149, Queen Victoria Street, E.C.4. No. 1011 is provided with thermal and No. 1013 with magnetic overload protective relays.

When it is necessary to cut out the auxiliary winding and condenser after the motor has accelerated an additional switch is required. This is frequently supplied by the motor maker and is sometimes of the centrifugal type.

Occasionally the condenser is in two portions, one part being cut out after the motor has started, leaving the other part permanently in circuit to improve the running power factor. The same effect is obtainable, without disconnection, by using both parts of the condenser in parallel for starting and in series afterwards. For these purposes starter No. 1025 is suitable. It has two contactors which close simultaneously when the button is pressed. After a predetermined interval a thermal timing device causes one of the contactors to open, thereby rearranging the condenser from the starting to the running position. This pattern of starter is available with magnetic or thermal overload relays as desired, and is suitable for use also when an auto-transformer is employed to impress a high voltage on the condenser in order to reduce its bulk.

The automatic starters are obtainable for single-phase capacitor motors up to 5 h.p. at 400 V, or 3 h.p. at 220 V, 25 to 60 cycles. Their prices range from £2 5s. to £8 15s., according to type and pattern.

The South-East England Breakdown

A review of the events

THE dislocation of the grid system in South-East and East England areas on Sunday last affected the supply of electricity to more than one quarter of the population of Great Britain in an area of about 12,000 sq. miles extending east of a line drawn from the Wash to Littlehampton. From official and unofficial information collected the disturbance can be divided into four stages.

At 11.24 a.m. the London Power Co. closed a bus section switch on its transfer bars at Battersea; this switch tripped and was reclosed at once seemingly without re-synchronising, which should not have been necessary had the two sets of bars been interconnected through the company's external system. The switch tripped immediately and the 70,000-kW set on load came out on 11-kV circulating-current protection; at the same time one of the 35,000-kW turbines at Deptford stripped its blades and another tripped.

Just before this happened the load on the stations, 113,000 kW, was being carried by one 70,000-kW set at Battersea and one 30,000- and two 35,000-kW sets at Deptford West; the local load was 73,000 kW and the total load on all stations was 300,000 kW. The other stations connected to the grid picked up the 91,300 kW approximately to the following extent: Brighton, 8,000; Norwich, 7,500; West Ham, 3,200; Brimsdown B, 7,100; Croydon, 3,500; Woolwich, 4,000; Barking, 35,000; Hackney, 4,000; Bankside, 16,800; Gravesend, 2,200. No particulars are obtainable of the additional loads (if any) taken up by Luton and Walthamstow and Kingston, which cut adrift at 11.30.

At about 11.35 the Battersea set was closed up again and carried about 25,000 kW, but was taken off owing to loss of oil at a 66-kV transformer bushing. Between 11.24 and 11.30, the load on the single 132-kV line in commission across the Thames rose from 90 to 290 A when the switch tripped at Northfleet at 11.30, and on the Croydon feeder from Northfleet from 120 to 190 A when it became dead at 11.43.

The log readings indicate that Deptford West became disconnected from the grid at 11.26. Apparently the opening of the Northfleet-Barking line coincided with the switching out of the third set at Deptford.

The dropping of the load at Barking caused the emergency governors on the turbines to trip and at 11.40 all switches were cleared by hand. Norwich kept going on the northern ring from 11.40 to 11.45 then shutting down, but local supplies were restored by 11.55. Brighton cleared from the grid at 11.50 but this cut off the supply to the Southern Railway until 3.5 p.m. Five minutes earlier than Brighton, West Ham was operating independently carrying its own load.

The two Northmet stations cut adrift at about 11.40 and Croydon was shut down from 11.45 to 1.40 p.m. Woolwich reported a total shut-down at 11.29 and was not normal until 12.20, but Hackney were off at 11.44 for two minutes only.

The stand of the County of London Electric Supply Co., Ltd., at the Gidea Park Modern Homes Exhibition mentioned on page 157

Bankside shut down at 11.44, and the C.E.B. connection was opened a minute later. The Walthamstow generator tripped on overload and the grid switch opened at 11.35. The machine was on the bars again at 11.38 and the station was paralleled with the grid at 12.50. Gravesend opened the grid switches between 11.40 and 6 p.m.

The London Power Co. states that it is not satisfied that the breakdown originated at Battersea or on its local system. Its officials were still carrying out investigations at the time of going to press.

Parliamentary News (BY OUR SPECIAL REPORTER)

ON July 30th Mr. Thorne asked the Minister of Transport whether he could give any information in connection with the electricity breakdown on Sunday last.

Mr. Hore-Belisha said that the Central Electricity Board had already issued a statement to the Press explaining the origin of this unfortunate trouble and the steps taken to meet it. He made immediate inquiries and had been assured by the Board that such a combination of circumstances was not likely to recur. [This matter is referred to above and in our "leader" on page 139 of this issue.]

Overhead Cables and Aerodromes

On July 30th Sir Gifford Fox asked the Under-Secretary of State for Air if he could state what steps his department took to prevent the erection of overhead electricity cables within one mile of any military aerodrome in this country; under what Acts such action was taken; and in how many cases schemes for the erection of such lines had had to be abandoned during the past five years on account of such refusal.

Sir P. Sassoon said that administrative arrangements had been in existence for some years whereby all proposals for the erection of overhead electric lines which might affect the safety of aircraft were referred to the Air Ministry for consideration. If there was any objection from this point of view, the matter was represented to the Electricity Commissioners, usually with an alternative suggestion, such as the diversion of the line or the placing of a section underground. The arrangements with the Commissioners were interdepartmental and administrative rather than statutory in their nature. So far as could be ascertained, no scheme for the erection of overhead cables had been abandoned as a result of Air Ministry objections, but a number of lines had been diverted or placed underground.

Sir G. Fox asked how many of the military aerodromes in this country obtained their electricity supplies from the mains or from an independent generating unit, respectively.

Sir P. Sassoon said that the numbers were now thirty-seven and twelve respectively.

Important Foreign Contracts

In the course of a statement last week regarding foreign trade, Mr. Runciman, President of the Board of Trade, referred to a number of important contracts received from abroad during the last six months. Included in these were contracts for the electrification of the Central Brazilian Railway, valued at over £3,000,000 and one for boiler plant for Finland to the value of £110,000.

The Growth of Electrical Imports

On July 31st Mr. Emmott asked the President of the Board of Trade whether his attention had been called to the fact that, according to the figures given in the *Board of Trade Journal*, the quantity of retained imports of electrical goods and apparatus was 73 per cent. higher in the three months ended June 30th, 1934, than in the three months ended June 30th, 1933; and if he would state when the Government would make a statement of the further measures that it proposed to adopt to protect the industry in this country.

Other members put similar questions with regard to the increased imports of iron and steel; vehicles; cutlery, hardware, etc.; manufactured goods; and machinery.

Dr. Burgin said that if the industries concerned considered that additional protection was necessary with regard to any class of goods which were subject to duty under the Import Duties Act, they should make representations to the Import Duties Advisory Committee.

The Adjournment

On July 31st Parliament adjourned for the summer recess and will reassemble on October 30th.

Business and Industrial Notes

The Week's Electrical Trade News from all Sources. Commercial and Industrial Developments, Business Changes, Market Prices for Materials, Trade Openings, New Publicity Literature, Liquidations, and Failures

The British Industries Fair

The Birmingham Chamber of Commerce reports that more than 92 per cent. of the available indoor exhibition space in the Engineering and Hardware Section of the British Industries Fair, which is to be held in Birmingham in May next, has been applied for by prospective exhibitors ten months in advance of the opening date.

Mr. J. P. Plant, chairman of the Birmingham Fair Management Committee, states that already applications for 242,917 sq. ft. have been received. In addition to applications from former exhibitors 152 firms have applied who have not exhibited at Castle Bromwich in previous years.

An Electric Delivery Van

The accompanying illustration shows an electric vehicle, made by Messrs. Partridge, Wilson & Co., performing the duties of a runabout delivery van belonging to a municipality, and as will be seen it is being used for the delivery of an electric cooker. The vehicle illustrated is of the 6-7 cwt. type

Delivering a cooker by an electric delivery van

described in our issue of June 22nd. The company is sending this mounted photograph to nearly all the municipal electricity departments throughout the country with a view to furthering the popularity of electric vehicles, and as one of its many publicity schemes.

A Cooker Demonstrator's Certificate

The Jackson Electric Stove Co., Ltd., has issued several certificates to demonstrators who have attended its course of instruction and have proved to be proficient in practical cookery, lecture demonstrating and salesmanship.

The certificates are only awarded to those demonstrators who have had a minimum of six months' experience in selling, after which they must pass a test in salesmanship and cookery. They are examined whilst actually giving lecture demonstrations to the public and they are judged on their ability to talk to the public and interest them for at least one hour.

Radio Valve Price Reductions

The Radio Valve Manufacturers' Association announces a reduction in the prices of battery valves made by its members. These include the "Cossor," "Mazda," "Ferranti," "Osram," "Marconi," "Mullard," "Philips," "Six-Sixty" and "Micromesh" brands.

Institute of Patentees

The Institute of Patentees has removed to 10, Victoria Street, S.W. The telephone numbers and telegraphic address remain unchanged. The new premises provide greater facilities, including writing and reading rooms, and there is also sufficient space for future laboratories, workshops, &c.

The Greek Electrical Market

In his report to the Department of Overseas Trade on the economic conditions in Greece (Stationery Office, 2s. net), Mr. A. N. Cumberbatch, Commercial Secretary to the British Legation, Athens, states that there was a marked reduction during 1933 in the imports of electric lamps, dynamos and electric motors from the United Kingdom, while during the latter part of the year the Greek import restrictions adversely affected the export of British machinery, gas and oil engines, and iron and steel goods in general. There is only one company of importance in Greece, the Société Anonyme "Fos," manufacturing electric lamps, the production by this company during 1932 totalling 265,000. This quantity is quite insufficient for local requirements, the imports during 1932 totalling 1,121,956 lamps of a value of Dr.14,972,738, although the figures for 1933 showed a falling-off at Dr.759,616 and Dr.12,219,309 respectively. Efforts have been made of late years to develop Greek industries, with the result that several articles which were previously imported entirely from abroad are now manufactured locally. Among these are electric accumulators, wire, cables, &c.

Mather & Platt Apprentices

On July 25th Mr. G. Guest, B.Sc., L.L.B., Deputy-Director of Education for the City of Manchester, visited the school conducted at Park Works for the education of apprentices employed by Messrs. Mather & Platt, Ltd., to address the boys on the occasion of the annual distribution of prizes. The chairman of the company, Mr. L. E. Mather, introducing Mr. Guest, gave a brief résumé of the work of the school, in which the teaching is non-vocational in character throughout the early years of a boy's apprenticeship and only assumes a technical nature after boys gain practical experience in the works and approach the stage of definite technical education or examination for an engineering degree. On entering Park Works the boys continue their ordinary studies in school premises provided by their employers, while the teaching staff is under the control of the Manchester Education Authority. Three prizes, provided by directors of the company, are given for each "year" in addition to a special prize for English and the Mather prize for all-round progress. Prize-winners this year came from the electrical, pump, textile and fire engineering shops, while the Mather Prize was secured by one of the boys employed at Salford Ironworks, the original headquarters of the firm.

Municipal Trading at Sydney

The Sydney City Council has confirmed its decision to discontinue the electricity sales branch after six months. During the discussion Alderman Shannon said it was a fight of Australian interests against those of overseas. He alleged that many retailers were selling electrical apparatus made in Japan which was not of a standard that would be approved by the Electricity Department.

New Municipal Showrooms

The new electricity showrooms of the Aldershot Town Council were opened on July 26th by Mrs. H. Ainger.

The "Dancing Lady"

During the showing of a film entitled "Dancing Lady," the proprietors of the New Tivoli Picture House, Edinburgh, seized the opportunity of making good use of a model of the "Mazda" dancing girl for the purpose of advertising the film. The accompanying picture, which is reproduced from a photograph taken by Mr. G. Greenfield, of Edinburgh,

The "Mazda" girl as a film advertisement

shows how this lady helped to make an attractive advertisement.

E.D.A. at Scarborough

The E.D.A. Mid-East England Area Executive Committee visited Scarborough on July 30th. At a luncheon at the Pavilion Hotel, a civic welcome was extended to the visitors by the Deputy Mayor, Ald. J. W. Butler. Other guests included the Mayor of Bridlington, the chairman of the Whitby U.D.C., the chairman of the Scarborough Electricity Committee (Ald. A. Moore), the chairman of the Bridlington Electricity Committee (Coun. H. Dunkerley), Coun. F. C. Whittaker, and Messrs. S. Foord, J. W. Piggott, and J. W. Fawcett. The speakers at the luncheon were Mr. T. Roles, Ald. Moore, Capt. A. W. Brown, the Deputy Mayor of Scarborough, and the Mayor of Bridlington. After lunch the Committee and guests, with their ladies, enjoyed a motor coach tour of Olivers Mount, Holbeck Clock Tower, the Rose

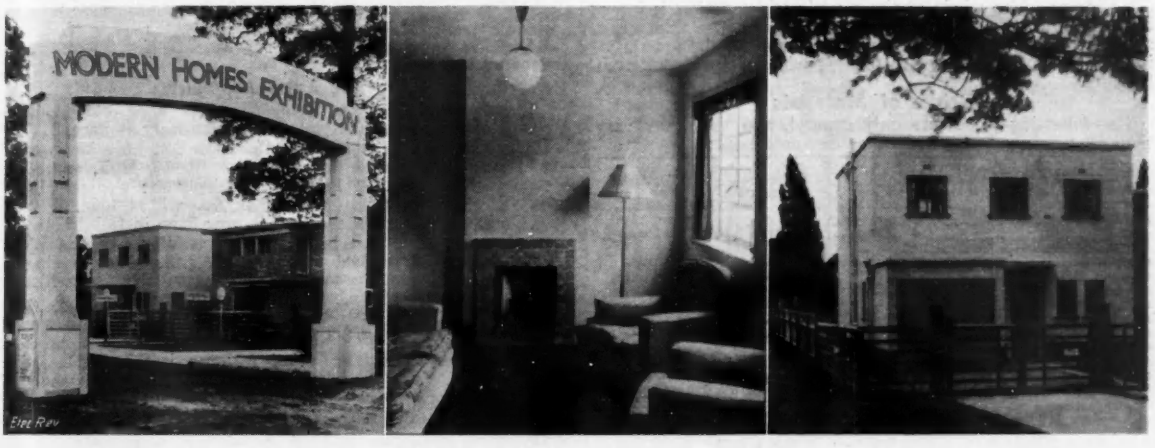
and Italian Gardens, and Peasholm Glen and Park. Later, the visitors were entertained to tea at the Medical Baths, and the day's proceedings were brought to a close by a visit to a performance of "Hiawatha" by the courtesy of the Scarborough Electricity Committee.

Modified Chinese Duties

Modifications of Chinese import duties on certain goods are announced in the *Board of Trade Journal* as operating from July 10th last. Among the goods affected are machine-shop tools (including pneumatic and electrically-operated tools), gas, oil and steam engines, hydraulic and steam turbines, turbo-generator sets, and other prime movers whether combined with generators or not, and parts thereof; steam boilers, economisers, superheaters, mechanical stokers and other boiler-room accessories and parts thereof; machinery not otherwise provided for; and certain parts of radio sets. In each case there is an approximate increase in duty of 2½ per cent. of the value.

A Modern Homes Exhibition

The Gidea Park Modern Homes Exhibition was opened on Tuesday last. This exhibition is the result of an all-British architectural competition held last year which produced about 500 entries from Great Britain and overseas. From these twenty-five designs were selected, from which thirty-five houses have been built at Gidea Park. Features of these houses are economy in cost, space, material, and domestic labour. Most of them make use of electricity for various purposes, while one of them, apart from a coal fire in the living room, is "all-electric." The kitchen has an electric cooker and electrically heated water system, and the three bedrooms have plugs for electric fires, and two have auxiliary reading lights above the beds. Most of the companies who provided the furnishings have stands in the centre of the exhibition, and these include the County of London Electric Supply Co., Ltd., which has a comprehensive display of domestic appliances, the Welbeck Co., which is showing the new Welbeck vacuum cleaner, Servis Washing Machines, showing its washing machine, and Autocar Electrical Installations, which is exhibiting electrical fittings and appliances, and radio receivers. The exhibition will remain open until August 20th.



The entrance to the Gidea Park Exhibition, the lounge, and an exterior view of the "all-electric" house

Social Events

Twenty-five members of the Merseyside electrical trades took part in the golf competition held under the auspices of the Wallasey and Birkenhead Electrical Trades Golfing Society at Leasowe on July 26th. The principal award was the Captain's (Mr. J. McKenzie) prize, which was won by Mr. E. G. Pulford, who recorded the score of one down. The competition was divided into two sections and the other prize-winners were: Second (Class A), Mr. L. V. Bryan (three down). Silver cup: Mr. C. Dunseath (two down). There was a tie for the Class B second prize, Mr. A. Hawkins (president) and Mr. G. A. Trace both recording scores of seven down. Following the competition, a function was held in the club-house at which Mr. A. Hawkins presided.

The Metropolitan-Vickers Electrical Co., Ltd., Cosmos Lamp Department, London office, was entertained by the Gravesend Corporation Electricity Department on its sports ground, Hill-side, Gravesend, on July 28th, at cricket and tennis. An enjoyable afternoon and evening were spent, the Cosmos Lamp Department winning the cricket match by 115 runs to 74, and the tennis tournament by 14 sets to 5.

The third sports meeting between the Yorkshire Electric Power Co. and the Lancashire Electric Power Co. was held on July 21st on the grounds of the Otley Mills Club. Colonel K. Duncan and Messrs. J. Atkinson and T. Suttle, directors of Messrs. Duncan Barraclough & Co., Ltd., and Mr. C. D. Taite, engineer and manager of the Lancashire Electric Power Co., were present. Mr. W. B. Woodhouse, engineer and manager of the Yorkshire Electric Power Co. was the host and he was accompanied by Mrs. Woodhouse. The rivalry between the companies extends into the realms of cricket, bowls and tennis, and in all these the Yorkshire Co. proved to be the stronger this year.

The new sports ground at Thames Ditton of the London & Home Counties J.E.A. Sports and Social Association was formally opened by Ald. B. J. Samels, chairman of the Authority, who is also president of the Association, in the presence of over a thousand visitors. In a brief speech Ald. Samels wished the new venture every success and opened the ground by cutting a ribbon round the pavilion. A number of races for the men and ladies provided keen contests, one of the chief events being a five-a-side "cricket match" between members of the Authority, represented by Viscount Falmouth, Lt.-Col. F. A. Cortez-Leigh, Messrs. Wilkinson, Croot and Stapleton, and the staff which was represented by Messrs. Gordon, Sarrer, Keene, Lovatt and Heslop, the members of the Authority proving the victors. Among others present were Viscountess Falmouth, Mrs. Cortez-Leigh, Ald. W. H. Shaw, Ald. and Mrs. H. B. Vorley, Mrs. L. Gordon, and Dr. and Mrs. Dudley Wright. At the conclusion of the sports, the prizes, which were given by members of the Authority, were presented by Ald. Samels, and the day was concluded with dancing on the green.

The annual works outing of Messrs. Wm. McGeoch & Co., Ltd., was held on July 14th. A large party, accompanied by Mr. P. McGeoch and members of the staff, left Birmingham by special train for Blackpool. The weather was perfect and lunch was served at the Casino Restaurant, after which visits were paid to the pleasure beach, bathing pool and other places of amusement and interest.

Recent Contracts

The Enfield Council has accepted the tender of Standard Telephones and Cables, Ltd., for the supply and installation of a Gamewell fire alarm system (value, £6,600) to the specification of the chief officer, Mr. A. H. Johnstone. This equipment will consist of eighty-three of the latest type of Game-well succession boxes, together with complete recording apparatus for two sub-stations and headquarters.

The E.M.B. Co. has received a second repeat order from Liverpool Corporation Tramways for fifty car sets of equal wheel bogies, complete with air and magnetic brakes, and with patent interlocked control of the air and magnetic brakes and sanding.

The Harland Engineering Co., Ltd., has secured the contract for a new pumping station for the municipal waterworks of the City of Riga, Latvia, in spite of severe German competition. The total capacity of the pumping station will be about 500,000 gallons per hour and about 700 h.p. The pumps, which will be of the company's "Spiroglide" type, will be electrically driven by three-phase squirrel-cage motors, automatically controlled from the water level in the city's water towers. The contract includes a stand-by alternator, also to be manufactured by the company, for use in case of failure of the Riga electricity supply, the necessary switchgear, air and vacuum vessels and their pumps, valves, overhead crane, and all accessories. Mr. C. R. Kemp, one of the directors of the company, flew to Riga and negotiated the contract with the city authorities.

The Mersey Tunnel Lighting

Referring to the article on this subject in our issue of July 20th, Messrs. Higgins & Griffiths, Ltd., inform us that they carried out the special lighting of the four entrances to the tunnel to the designs of Mr. H. J. Rowse, F.R.I.B.A., architect to the Mersey Tunnel Joint Committee, and to the requirements of the Mersey Tunnel engineers. The seventy-two iron standards and the architectural bronze lighting units at the toll-booths, and the bronze lanterns at the lighting-shafts were made by Messrs. H. H. Martyn & Co., Cheltenham, Messrs. Higgins & Griffiths being sub-contractors for the whole of the lighting effects and for the external and internal lighting of the twelve toll-booths.

They were also responsible for the design, supply and erection of five special lamps of the revolving type, equipped with eight 500-W lamps and asymmetric prismatic and twenty-nine

smaller type lamps equipped with 1,500-W lamps with asymmetric prismatic reflectors carried on concrete posts.

The central lighting shaft illustrated on page 100 of our last issue has two supplies; the main lighting bowl is fitted with vitreous enamel reflectors and contains ten 400-W "Osira" lamps and ten 500-W gasfilled lamps. The pinnacle above is fitted with special section architectural lamps and holders, sixty-three in all. The top bowl is fitted with three 500-W gas-filled lamps. The whole of the electrical installation is interlocked by means of trip switches and contactors, so that when any person is going up the shaft the whole of the apparatus is dead, except a special 50-V circuit which provides internal lighting.

The Willesden Fire Brigade of the British Thomson-Houston Co., Ltd.

Prices of Materials

The following prices are only general, and they may vary according to quantities and other circumstances:—

CHEMICALS, ETC.	Price. August 1st.	Fortnight's Inc. or Dec.
a Acid, Oxalic ... ... per cwt.	50s.	—
a Ammoniac, Sal ... ... per ton	£40	—
a Ammonia, Muriate (large crystal) ... ,,	£38	—
a Borax ... ... ,,	£17	—
a Copper, Sulphate ... ... ,,	£19 15s.	—
a Potash, Chlorate ... ... per lb.	3½d. to 4½d.	—
a ,, Perchlorate ... ... ,,	6d.	—
a Shellac T.N. ... ... per cwt.	£4 18s.	—
a Sulphur Commercial... ... ... per ton	£11	—
a ,, Roll ... ... ,,	£11	—
a Soda Chlorate ... ... per lb.	3¼d. to 3¾d.	—
a ,, Crystals... ... ... per ton	£5 to £5 5s.	—
a Sodium Bichromate, casks ... ... per lb.	4d. nett.	—
METALS, ETC.		
b Aluminium, Ingots ... ... per ton	£100 to £105	—
b ,, Wire ... ... per lb.	1/1 to 1/9	—
b ,, Sheet and Foil... ... ... ,,	1/2 to 2/9	—
p Babbits Metal and Anti-friction Metals—		
Grade I ... ... per ton net	£207	—
Grade II ... ... ,,	£141	—
Grade III ... ... ,,	£68	—
c Brass (rolled metal 2" to 12" basis) ... per lb.	6½d.	¼d. dec.
c ,, Tubes (solid drawn) ... ... ,,	8¾d. to 9d.	¼d. dec.
c ,, Wire, basis ... ... ,,	7¼d.	¼d. dec.
c Copper Tubes (solid drawn)... ... ,,	9¼d.	¼d. dec.
d ,, Bars (best selected)... ... per ton	£58	£2 dec.
d ,, Sheet ... ... ,,		
d ,, Rod ... ... ,,		
d ,, (Electrolytic) Bars ... ... ,,	£33	£1 5s. dec.
d ,, ,, Sheets ... ... ,,	£31 15s. to £32 5s.	5s. to 15s. dec.
d ,, ,, Wire Rods ... ... ,,	£41 10s.	—
d ,, ,, H.C. Wire ... per lb.	6⅛d.	⅛d. dec.
f Ebonite Rod ... ... ,,	1/3 to 1/6 plus	—
f ,, Sheet ... ... ,,	1/3 to 1/6 10 %	—
n German Silver Wire ... ... ,,	2/5	—
h Gutta-percha, fine ... ... ,,	nom.	—
h India-rubber, Para fine ... ... ,,	5¼d.	—
i Iron, Pig (Cleveland No. 3)... ... per ton	62/6	—
i ,, Wire galv. No. 1, P.O. qual. ... ,,	£20	—
g Lead, English Pig ... ... ,,	£12 15s	5s. inc.
g Mercury ... ... per bot.	£117s.6d. to £11 12s.6d.	—
c Mica (in original cases) small ... per lb.	6d. to 3/6	—
c ,, ,, medium ... ,,	4/- to 8/-	—
c ,, ,, large ... ,,	8/6 to 17/6 & up	—
p Phosphor Bronze, plain castings ... ,,	1/1	—
p ,, ,, drawn bars & rods ,,	10½d.	½d. dec.
p ,, ,, rolled strip & sheet ,,	10½d.	½d. dec.
p ,, ,, wire ... ... ,,	11¼d	½d. dec.
o Platinum ... ... per oz.	£7 15s.	—
d Silicium Bronze Wire ... ... per lb.	7½ d.	⅛d. dec.
r Steel, magnet, in bars ... ... ,,	7½d.	—
n Tin, Block (English) ... ... per ton	£231 15s. to £233 15s.	15s. inc.
g ,, Wire, Nos. 1 to 16 ... ... per lb.	3/8	—

Quotations supplied by:—

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India-Rubber, Gutta Percha and Telegraph Works Co., Ltd.
g James & Shakespeare.
h Edward Till & Co.
i Bolling & Lowe.
l Richard Johnson & Nephew, Ltd.
n P. Ormiston & Sons.
o Johnson Matthey & Co.
p C. Clifford & Sons, Ltd.
r W. R. Dennis & Co.

The above table is published here fortnightly. In alternate issues, in which it does not appear, the latest prices of copper, silicium bronze wire, lead and rubber, up to the time of going to press, are given in our "Business Notes" under the same heading.

Annual Holidays

The Birmingham works of Veritys, Ltd., will be closed from to-day (Friday) until August 11th inclusive.

Great Britain's Position in India

The recently issued annual statement of the sea-borne trade of British India for 1932-33 gives much interesting detail regarding the various countries participating in this trade which does not appear in the monthly statements. Of the total value of electrical goods, not including machinery, but including cable, instruments, and telegraph and telephone apparatus, imported into India during the year, the share of the United Kingdom was approximately one-half, the figure being 1,21,51,000 rupees, an increase of 6,23,000 rupees on the previous year. The only other outstanding increase was in Japan's imports, which stood at 16,80,550 rupees, more than three times the total of 1931-32. But both Germany and the United States, with 34,42,000 rupees and 26,57,100 rupees respectively remained the next most important suppliers after the United Kingdom. Japan made a big advance in the trade in electrolytic copper wire, electric lamps, and lighting accessories, largely at the expense of the United States.

In the electrical machinery trade last year, with an aggregate value of 1,55,88,500 rupees compared with 2,16,26,100 rupees in 1931-32, the share of the United Kingdom was well maintained at 1,20,89,700 rupees, as against 1,50,07,200 rupees, while that of the United States dropped to only 15,87,000 rupees, a decline of 20,60,000 rupees on 1931-32, and of 12,00,000 on the average for 1928-32. Germany was the only other considerable supplier but, at 10,37,000 rupees, showed a decline on the year of 4,70,000 rupees.

Trade Announcements

Superlamp, Ltd., has transferred its head office, showrooms and stores to 6, Paul Street, Finsbury Square, E.C.

The Electrical Equipment and Carbon Co., Ltd., has opened a branch office and stores at 9, Dock Street, Hull, under the supervision of Mr. G. Pickbourn (telephone: Central 31335). Stocks of cable, conduit, switchgear, &c., will be held.

A private teleprinter service has now been installed between the London office and the Chippenham Works of the Westinghouse Brake & Saxby Signal Co., Ltd. The installation at each end includes a Westinghouse metal rectifier, which is a standard part of a.c. teleprinter equipment.

American Electrical Trade

The General Electric Co. of America is reported to have received orders to the value of 92 million dollars for the first six months of 1934 as compared with 61 millions in the corresponding half of 1933. The increase is 51 per cent.

A Remarkable Model House

An eight-roomed house built and equipped by the Westinghouse Electric & Mfg. Co. at Mansfield, Ohio, provides a glimpse of what the future has in store for the housewife in the way of ingenious electrical apparatus. The building, which is known as the "Home of To-morrow," is used to test devices which are being developed, and the extent to which electricity is utilised is evidenced by the fact that if all the switches were turned on simultaneously electrical energy equal to the efforts of 864 servants would be at work. The first "miracle" which greets the visitor is the operation of the garage doors. These may be controlled remotely either by radio in the car or by a key fitted into control mechanism in the drive. The house is completely air-conditioned from a "weather room" in the basement. The process consists of cleaning, humidifying, or dehumidifying, and warming or cooling, the air being dispersed to the various rooms through ducts. Illumination is shadowless. In the dining-room the main lighting unit provides a variety of colours to harmonise with the surroundings. Among the many other interesting devices are automatic sliding doors, an intercommunication system in the house, an all-electric laundry, a cooking range of much higher efficiency and with units that heat more rapidly than any yet developed, an automatic dishwasher, refrigerators with unique features, infra-red and ultra-violet lamps, seven radio sets (including an all-wave receiver), and a multitude of small appliances hitherto hand operated. All the electrical devices and the lighting are controlled by Westinghouse no-fuse load centres.

New Catalogues and Lists

Negretti & Zambra, 38, Holborn Viaduct, London, E.C.1.—A complete catalogue of mercury-in-steel thermometers.

W. Andrew Bryce & Co., Woodfield Works, Bury, Lancs.—A catalogue of mains radio equipment and "Peak" condensers.

English Electric Co., Ltd., Stafford.—Leaflets on fractional horse-power motors, a burn-out protector for a.c. machines, Diesel-electric powering for tugs, and modern Diesel engines.

Metal Components, Ltd., Arundel Place, Eastern Road, Brighton.—A catalogue of "Safeways" bakelite accessories.

A. Reyrolle & Co., Ltd., Hebburn-on-Tyne.—Particulars of the Holmes single-operator arc-welding generators.

Berkeley & Young, Ltd., Tyseley, Birmingham.—A leaflet describing "B. & Y." kettles and the "Nippy" cooker.

Engineering & Lighting Equipment Co., Ltd., Sphere Works, St. Albans.—A catalogue of new fittings for gas-discharge lamps.

Fredk. Braby & Co., Ltd., Ida Works, Deptford, S.E.8.—A leaflet on wire guards.

Switchgear & Equipment, Ltd., Delavox Works, Banbury.—A pamphlet on improved h.v. liquid fuses.

Ladbrook Stampings, Ltd., Ruston Street, Birmingham, 16.—A catalogue of stampings, piercings and spinnings.

Wego Condenser Co., Ltd., Bideford Avenue, Perivale.—A pamphlet on interference elimination.

G.W.B. Electric Furnaces, Ltd., Dibdale Works, Dudley, Worcs.—Particulars of the "Rotolec" electric decorating kiln.

Davidson & Co., Ltd., Sirocco Engineering Works, Belfast.—A copy of "Sirocco Contracts" No. 2.

J. Stott & Son, Ltd., 9, Sheil Road, Liverpool, 6.—A leaflet on a new type of patent wallplug.

Bankruptcy Proceedings

I. A. G. Young and **B. G. Wood**, trading in partnership as National Radio Supplies, New Arcade Buildings, Market Place, Burton-on-Trent, Staffs.—The public examination herein was held at the Court House, Station Street, Burton-on-Trent, on July 25th. According to the joint statement of affairs filed there were gross liabilities of £1,269. The assets were estimated to realise £45. Debtors attributed their failure to lack of capital, heavy interest incurred in carrying out hire-purchase transactions through a finance house at heavy discount; trading at insufficient margin of gross profit, and bad trade generally. The debtor, I. A. G. Young, said that he and Bernard Wood commenced trading as wireless dealers in Derby and Burton, with a joint capital of £50. The former had had no previous experience of the trade, but his partner had. They transacted business on hire-purchase terms, obtaining assistance from a finance house. When they commenced trading at Derby they took £65 a week, and anticipating further success they opened at Burton, obtaining a seven-years' lease of premises. The debtor, Bernard G. Wood, was serving a term of imprisonment, and the examination was adjourned for his attendance.

A. E. L. Trebilcock, trading as Lionel Trebilco, Holyrood Street, Chard, wireless dealer.—The first meeting of creditors was held on July 20th, at Taunton, when the statement of affairs showed liabilities of £349 and assets of £63, leaving a deficiency of £286. Debtor stated that he commenced business on his own account in August, 1932, at a lock-up shop in Silver Street, Chard, and in January, 1933, removed to his present address. He relied mostly on sales as he had little repair work to do, but he was handicapped by lack of window space to display his stock. He also had the competition of other dealers to contend with and the after-effects of illness occasionally rendered him unfit for business. He became aware of his position in July, 1933, when creditors commenced to press. He continued to trade, hoping that the wireless season which commenced at the end of August, 1933, would prove remunerative. The case, being a summary one, was left in the hands of the Official Receiver as trustee.

G. E. Morris, 46A, Newcastle Avenue, Worksop, wireless dealer.—The first meeting of creditors in this matter took place at the Official Receiver's offices, Figtree Lane, Sheffield, on July 25th. The statement of affairs showed unsecured liabilities of £159 and a deficiency of £115. Debtor said his failure was due to insufficient turnover to provide for expenses and living, loss on a butchering business, and loss on a car. The case being a summary one was left in the hands of the Official Receiver, as trustee.

G. Tate, 14, Lascelles Road, Leeds, electrician.—The public examination herein took place on July 24th at the County Court House, Albion Place, Leeds, and was closed. Debtor said his failure was due to lack of capital, and bad trade. His statement of affairs showed a deficiency of £146.

L. E. Pearce (St. John's Electrical Co.), electrical engineer, 48, St. John's Road, Tunbridge Wells.—Receiving order made July 20th on debtor's own petition. First meeting, August 3rd, at 8, Old Steine, Brighton. Public examination, October 10th, at the Town Hall, Tunbridge Wells.

C. Uron (Eclipse Wireless Co.), 120, Stapleton Road, Bristol.—Public examination September 21st at the Guildhall, Bristol.

M. Glanfield (Broadway Radio), 7, Broadway, London Road, Portsmouth.—Public examination August 13th at the Court House, Portsmouth.

R. E. Young, wireless and electrical engineer, 8, Manchester Road, Swindon.—Application for discharge to be heard on August 15th at the County Court Buildings, Swindon.

S. L. Holt, electrical and radio engineer, 46, Highland Terrace, Uffculme.—Trustee, Mr. W. R. Cocks, Exeter Bank Chambers, Broadgate, Exeter, Official Receiver, released June 29th.

A. E. Hilton, electrician, 104, Carolgate Bridge, Retford.—Trustee, Mr. E. C. Midgley, 1, St. Swithin's Square, Lincoln, Official Receiver, released June 29th.

D. G. Morris (Brynmor Radio Depôt), radio and electrical engineer, Sea View, Pembrey.—Receiving order made July 25th on debtor's own petition.

H. G. Hutchinson (Eagle Distributing Co.), wireless distributor, "Cranleigh," Langho, nr. Blackburn.—Trustee, Mr. J. W. Carter, District Bank Chambers, Blackburn, Official Receiver, released June 29th.

P. Howden (Bradford Radio Service), 73, Otley Road, Bradford.—Trustee, Mr. J. O. Morris, 71, Manningham Lane, Bradford, Official Receiver, released June 29th.

Company Liquidations

Radio Exchange Service, Ltd.—Winding up voluntarily. Liquidator, Mr. W. Cardwell.

Agra Engineering Co., Ltd.—Winding up for reconstruction purposes. Liquidator, Mr. V. R. Symons, Bridge Buildings, Barnstaple.

Electric Advertising Clocks, Ltd.—Winding up voluntarily. Liquidator, Mr. W. T. Piggott, 16 and 17, South Street, E.C.2. Particulars of claims to the liquidator by August 31st.

Dissolution of Partnership

Barraclough Radio, radio and electrical manufacturers, London Bridge Works, Wembley Hill, Middlesex.—Messrs. W. C. Barraclough and L. E. Parkes have dissolved partnership. Mr. Parkes will attend to debts.

Sterilising Soil Electrically

THE consumption per kW of maximum demand for a soil sterilising installation is low compared with other horticultural loads. Its value to the supply undertaking, therefore, is small, but to the horticulturist its value is equal to that of any other use of electricity, especially where research crops are to be grown. Though many horticulturists still fumigate soil by chemical action, the chemicals necessary for soil treatment against certain injurious bacteria and insect pests are harmful to seeds or plants sown after treatment has been carried out. For this reason sterilising soil by raising its temperature electrically is finding favour among horticulturists.

A temperature of about 72 deg. C. is sufficient to destroy most worms and insect pests, and by increasing the soil temperature to between 80 and 85 deg. C. it can be completely cleared of nearly all diseases harmful to plants. For electric hot beds the heat is supplied to the soil by means of buried cables, but the life of the cable would be greatly reduced if run at a temperature above 50 deg. C.

For the higher temperatures necessary for soil sterilisation the current is passed directly through the soil by placing two or more metal plates in the soil and passing electricity between them. Two ¼in. thick copper plates with the necessary wiring, and in special cases a step-down transformer, is the only apparatus required. The length and width of the plates depend upon the width of the soil bed and the depth of the soil to be treated, and the spacing varies with the type of soil. The plates can be spaced so that the flow of electricity does not exceed the carrying capacity of the circuit, and since the specific resistances of various types of soils are obtainable, the spacing can be calculated with considerable accuracy. The moisture content of the soil, however, affects the resistance and the correct spacing can often be best determined by "trial and error" by placing the plates some distance apart and gradually reducing the spacing until full load is obtained.

Due to the decomposition of the particles of moisture when current is first switched on, the contact resistance between the particles of soil is reduced thus causing a decrease in the resistance of the soil and, therefore, a heavy flow of electricity. After this initial rush, there is a fall to a steady value until the high temperatures are reached. The drying out of the soil around the plates then increases their contact resistance with the soil, which causes a drop in the flow of electricity. If this drop is such that the required temperatures are not reached, the soil may be slightly dampened around the surface of the plate to reduce the contact resistance. When a temperature of about 80 or 85 deg. C. is reached the electricity may be switched off, as the soil will retain its temperature for the period necessary for sterilising.

Power Consumption

The power consumed depends entirely upon the type of soil to be treated. As the higher temperatures are maintained for only short periods, the loss of heat due to conduction and radiation is but a very small percentage of the total heat supplied to raise the soil from cold to the required temperature. The consumption can, therefore, be taken as the amount of electrical energy required to raise the temperature of the soil only. Since the specific heats of the substances of which soil is composed are comparatively low, ranging from 0.1 to 0.2, only about one-seventh the amount of heat is required to raise the soil temperature one degree as would be required to produce the same temperature rise in an equal weight of water. Excessive dampness of the soil, therefore, causes a large increase in power consumption.

The specific heat of a fairly dry light loam is about 0.15. At this figure the consumption works out at about 0.9 kWh per cubic foot of soil treated. A plot of soil 100 square feet 6 in. deep can be treated for a consumption of 45 kWh. Though this figure appears excessive with current at anything over ½d. per kWh, the cost is more than covered by the increase in the value of the crop, especially when expensive crops are to be grown.

The heavy loading required to obtain rapid temperature rises necessitates that the soil should be treated in small plots wherever possible. Complete soil sterilisers have been designed for the treatment of the soil of seed boxes and small plots.

Electricity Supply

Lighting, Domestic, Power

Allendale (Northumberland).—SUPPLY SOON.—An immediate start is to be made by the North-Eastern Electric Supply Co., Ltd., Newcastle, in supplying electricity to Allendale. The cost will be £1,000, and it is expected that the work will be completed by November.

Barnstaple.—ELECTRICITY WORKS EXTENSIONS.—The Lighting Committee has approved the action taken by Mr. J. H. Rider, consulting engineer, in reference to the Council's proposals for extending the electricity works, and he has been asked to press for an early decision by the Electricity Commissioners.

Belgian Congo.—ANNUAL PROGRESS.—The report of the Société Générale des Forces Hydro-Electriques du Katanga (Sogefort) for last year shows that the output of electric power during the twelve months amounted to 89,350,000 kWh, as compared with 47,270,000 kWh in 1932, the increase being largely due to the greater demand from the copper-smelting works. A new h.v. transmission line has been erected to transmit power to the Elizabethville and Kipushi districts.

Birmingham.—HAMS HALL EXTENSIONS.—The Electricity Committee is considering extensions to the Hams Hall power station so that, when completed, the overall capacity of the undertaking will be 248,000 kW. The total cost, after adding 5 per cent. for contingencies, will be £1,054,100.

Botley (Hants).—CHURCH LIGHTING.—The Parochial Church Council is considering the installation of electric lighting in the parish church.

Braunton (Devon).—PURCHASE OF UNDERTAKING.—A special meeting of shareholders of the Braunton Electric Light Company was held last week to consider the offer made by the Whitehall Securities Corporation, Ltd., to purchase the whole of the share issue of the company. The necessary 75 per cent. agreement among the shareholders to sell was forthcoming and the purchase price agreed on is 45s. for each £1 share in the company and 30s. for each preference share. Some discussion arose concerning a higher offer stated to have been made on behalf of the Southern Areas Electric Corpn., but eventually the Whitehall Company's offer was accepted. The Braunton Company's capital is £5,000 and assets about £13,000. Last year a dividend of 10 per cent. was paid.

Brighouse.—REVISED CHARGES.—The profitable result of the past year's trading is reflected in the adoption by the Town Council of a scheme to increase the discount on all supplies, as from July 1st, from 10 to 15 per cent., bringing the net cost of electricity for lighting to 3.4d. per kWh and for heating to 0.85d. per kWh. Meter rentals have been reduced by half. A tariff is being introduced consisting of a fixed charge per annum for houses according to floor space, and a subsequent price of ½d. per kWh for general domestic purposes, such as lighting, heating, &c. The new system is optional.

Brighton.—REDUCED CHARGES.—The Electricity Committee is to reduce the fixed charge for the domestic contract rate by approximately 15 per cent. as from October 1st.

Bristol.—POWER STATION EXTENSIONS.—At a cost of £375,644, extensions are to be made at the Portishead generating station. The Electricity Committee anticipates an increased demand for supplies in the South-West of England and South Wales. Four boilers, with buildings and plant, are to be added to the station, and the Central Electricity Board will be responsible for the annual charges for the capital expended.

Bury St. Edmund's.—LOAN.—The Town Council has applied for a loan of £6,004 for electricity purposes.

Cardiff.—SUPPLY FOR NEW STEELWORKS.—The Electricity Committee has decided to apply for sanction to establish a 33-kV system and to borrow the sum of £66,471 in connection with the provision of a supply for large new steelworks now under construction.

Chichester.—REDUCTION IN POWER CHARGES.—Following the satisfactory results of the city's electricity undertaking for the past year the Electricity Committee has decided to reduce the charges for power to 1½d. per kWh for the first 20,000 kWh, 1d. for the next 30,000 kWh, 0.9d. for the next 50,000 kWh, and 0.8d. for all energy beyond 100,000 kWh. The "unit" charge under the two-part tariff has been lowered to 0.6d. in the city and to ¾d. outside.

EXTENSIONS.—Mains extensions are to be carried out at an estimated cost of £911.

Corwen.—REDUCED CHARGES.—The Lighting Committee has decided to reduce the lighting rate from 6d. to 5d. per kWh.

Downham.—ELECTRICITY FOR L.C.C. ESTATE.—The South Metropolitan Electric Light & Power Co., Ltd., proposes to lay mains and construct two sub-stations in order to supply electricity to a portion of the London County Council's housing estate.

Earlestown and Newton.—CONCESSION TO CONSUMERS.—Electricity consumers supplied under the rateable value tariff will have a "unit" charge of ½d. all the year round as a result of a recent decision of the Council to continue the tariff reductions and increases of discounts introduced on January 1st last.

East Anglia.—TARIFF REDUCTIONS.—The East Anglian Electric Supply Co., Ltd., has adopted reduced charges as from April 1st last. On the No. 1 domestic rate the quarterly payment is reduced from 25s. to 18s., plus 1¼d. per kWh; the flat rate for heating and cooking from 4d. to 1¾d. per kWh; on the rate for business premises the charge is lowered to 1¼d. per kWh and the quarterly payment based on wattage instead of floor area; for lighting for farm buildings the kWh charge is reduced as in other cases, and the minimum charge is reduced from £6 to £4 per annum, provided the lighting load does not exceed 300 W, and a farmer paying the minimum of £6 per year can use, subject to certain restrictions, up to 10 h.p. of motors without paying the kW charge.

Eastbourne.—LOAN.—The Electricity Committee is to seek sanction to borrow £15,000 for the purchase of cookers, water heaters, &c.

Harrow-on-the-Hill.—CHANGE-OVER.—The Harrow Electric Light & Power Co., Ltd., has notified consumers of the pending change-over to a.c. and is asking for information regarding consumers' apparatus.

Hastings.—LOAN.—The Electricity Committee is seeking sanction to borrow £10,000 for house services.

Hemel Hempstead.—OVERHEAD LINES.—The Rural District Council has approved overhead cable extensions at Flamstead for the Luton Corporation, and at Bovingdon for the Watford Corporation.

Holland.—PROGRESS OF ELECTRIC COOKING.—The N.V. Provincial Utrecht Electricity Supply Co. reports that the campaign in favour of the use of electrical cooking appliances in its area is making very satisfactory progress. About 2,500 fishing families in the Spakenburg district now have all their meals prepared electrically.

Hull.—LOANS.—The Electricity Committee has received sanction to borrow £8,454 for distribution extensions, and £5,125 for trunk main extensions in the western area.

Further details in connection with the proposed extension of Sculcoates generating station have been received. They include the installation of the 25,000-kW turbo-alternator set authorised by the Electricity Commissioners, making it necessary to apply for sanction to borrow £13,346 to cover the additional expenditure. It was decided to make application accordingly. Subsequently the town clerk reported that the Commissioners had forwarded sanction to borrow £70,000 on account, in respect of the total estimated cost of the turbo-generator set. They stated that consideration would be given to the issue of a further loan sanction in respect of the balance of the works upon receipt of particulars which had been asked for.

Kent.—LOAN.—The County Council has received sanction to an expenditure of £6,500 in connection with the electricity supply to the mental hospital at Chartham, near Canterbury.

Kettering.—ELECTRICITY RELIEVES THE WATER SHORTAGE.—Serious water shortage at Kettering has necessitated curtailing the supply to three hours daily. The existing reservoirs at Thorpe and Cransley feeding Clover Hill pumping station at Kettering are nearly exhausted and £20,000 schemes are in progress to provide relief supplies. The major scheme (£13,369) provides for a permanent pumping station at Newbottle Bridge, Harrington, to pump from the Ise Brook into Thorpe reservoir. The equipment includes a 135 h.p. motor running at 1,480 r.p.m. driving a two-stage multi-medivane pump to deal with 60,000 gal. an hour against a 300-ft. head. The Electricity Department is installing the electrical gear, fed by a 12,000 V overhead supply brought 1½ miles from the branch line supplying Arthingworth. A step-down transformer is installed in the pump house. Other temporary schemes include pumping from springs at Mawsley Wood at a cost of several hundred pounds and from a 25 million gal. boating lake in Wicksteed Park, Kettering (£4,500). Water will be delivered to Clover Hill by a lake-side pump through a 3-mile 6-in. main laid overland.

Kingston-on-Thames.—LOAN.—The Town Council is to apply for a loan of £2,000 for meters.

TARIFF CHANGE.—A new tariff is to be adopted as from October 1st next. On the flat rate, the charges are to be 3½d. per kWh for the first 12,000 kWh, instead of 4d., and 2d. for all over 48,000, instead of 2½d. The charge for prepayment-meter energy is to be 4d., instead of 5d., and the "unit" charge for after-hour shop lighting 2d., instead of 3½d. Under the two-part tariff, the fixed annual payment is reduced in most cases by 5s. per annum, for business premises the fixed charge is 17s. 6d. per 100 W capacity instead of £1, and for power there is a reduction of 5s. per h.p.

Lanarkshire.—ELECTRIC-LIGHTING SCHEME.—The County Council has agreed to allow the Clyde Valley Electric Power Co. to install electric light for the Shotts housing scheme, and the streets will also be lighted by electricity instead of gas, at a cost of £15,000.

Leeds.—SUB-STATION.—The Electricity Committee is to erect a sub-station on a site at Wykebeck Valley Road.

LOAN SANCTIONED.—The Committee has obtained sanction to borrow £30,000 for installations under the assisted-wiring schemes.

Liverpool.—CLARENCE DOCK SCHEME.—The Electricity Commissioners have sanctioned the borrowing by the Corporation of a further sum of £30,285 for the completion of the first section of the Clarence Dock power station.

THE PRESCOT UNDERTAKING.—Mr. P. J. Robinson, the city electrical engineer, submitted to the last meeting of the City

Council a report with reference to the acquisition of the Prescot electricity undertaking owned by British Insulated Cables, Ltd. Mr. Robinson proposes that the generating plant should be shut down, and that the whole of the electricity required in the area be provided by the Central Electricity Board, whose supplies are at present drawn from the generating plant of the Liverpool Corporation. The Prescot Urban District Council, which at present holds the right of repurchase, has decided to waive any right of repurchase until the expiration of forty-two years, subject to consideration being given to it in a schedule of charges. Application is now being made by the Liverpool Corporation for powers to borrow £136,278, the purchase price of the undertaking, and £27,830 for cables, transformers and switchgear. The St. Helens Town Council has intimated its desire to obtain the rights of supply in that portion of Prescot which is now within the St. Helens borough boundary, but the Liverpool City Council feels that in this case St. Helens should be prepared to pay its due proportion of the purchase price of the Prescot undertaking.

London.—SOUTHWARK.—The Electricity Committee is to undertake further free-wiring installations at a total estimated cost of £874.

BERMONDSEY.—An additional supply to the Bermondsey Wall area is to be provided at an estimated cost of £3,090.

ST. PANCRAS.—The Electricity Committee recommends affording an a.c. supply to a new cinema in Arlington Road and Wellington Street (£1,635). The Committee also recommends the provision of additional switchgear and mains at an estimated cost of £1,494 to meet the anticipated increase in load in the area served by the Regent's Park sub-station.

WANDSWORTH.—It was reported at last week's meeting of the Borough Council that the County of London Electric Supply Co., Ltd., had received a deputation from the Council regarding its request for a reduction in electricity charges, and had agreed to consider the matter. A further meeting with the company would probably take place this week.

Luton.—LOAN.—Application is to be made to the Electricity Commissioners for sanction to a loan of £2,209 for a supply to Pitstone and Marsworth.

Maidstone.—MAINS EXTENSIONS.—The Town Council has sanctioned extensions of mains to petrol stations in Ashford Road at an estimated cost of £367 and to Gallant's Lane (£1,050).

Norwich.—LOANS.—Loans for wiring (£50,000) and meters (£50,000) are being sought by the Town Council.

Oldham.—NEW CHARGES.—The following charges per kWh are to be adopted as from the end of the year: Flat rate lighting 4d.; prepayment lighting, ordinary, 4½d.; assisted-wiring scheme, 6d.; shop lighting, two-rate, 5½d. and 2½d.; after hours shop-window lighting, 2d.; outside lighting and advertising, two rate, 4d. and 2d.; rateable value tariff, 20 per cent. of first £10 of annual net rateable value and 15 per cent. of all in excess of £10, plus ½d. per kWh; small-power scale, first 1,000 kWh per quarter at 1½d., all in excess at 1d.; alternative tariff for theatres, £10 per annum per kW of installed demand, plus 1d. per kWh.

Oswestry.—LOAN.—The Council has adopted the recommendation of the Electricity Committee to make application for sanction to borrow £10,380.

Ruskington.—RIVAL SCHEMES.—The Mid-Lincolnshire Electricity Supply Co. has brought cables to the fringe of Ruskington where for eight years the Ruskington Electric Supply Co., Ltd., has supplied consumers and the Council for public lighting. As the County Council will not permit two schemes of overhead cables, the directors of the local company were empowered, at an extraordinary meeting of shareholders, to sell at a price determined by them, unless bulk supplies can be purchased from the Mid-Lincs Co.

Sheffield.—MAINS EXTENSIONS.—The Electricity Committee is to extend mains at a cost of £12,866.

South Africa.—JOHANNESBURG.—The City Council has adopted the recommendation of the Tramway and Lighting Committee to establish an electricity showroom in the city. The cost is estimated at £1,200 a year, with initial expenses of £300.

KRUGERSDORP.—The Town Council is raising a loan of £142,250, which includes £28,500 for the electricity reconstruction scheme. At Springs a loan is also to be raised, of which £21,000 is to be spent on the electricity scheme.

Stoke-on-Trent.—REDUCED CHARGES.—The Electricity Committee recommends the following reductions in charges per kWh for supply (previous charges in parentheses): Lighting, 4d. (4½d.); late shop-window lighting and outside lighting, 1½d. (1.4d.); prepayment meters, 5d. (6d.); prepayment meters (assisted wiring), 6½d. (7½d.); places of public worship, 2½d. (3d.); theatres and picture palaces, 2½d. (3d.) for the first 1,000 kWh per month and 2½d. (2½d.) for all in excess.

LOAN.—The Committee is seeking sanction to borrow £10,000 for the assisted-wiring schemes, and has received sanction to a loan of £5,555 in connection with the proposed supply to houses in course of erection on the Stanfield Estate, Burslem.

FRINGE ORDER.—A Fringe Order has been obtained from the Electricity Commissioners permitting the Electricity Committee to supply to premises in the rural district of Cheadle outside the Corporation area of supply.

SUB-STATIONS.—The Committee is to erect sub-stations at High Street, Burslem, and Granville Place, Longton.

CHANGE-OVER.—The Committee has authorised the electrical engineer to complete the change-over of supply in the Newport Lane area, Burslem, at an estimated cost of £850.

SUPPLY EXTENSIONS AND IMPROVEMENTS.—The Committee is to improve and extend the supply in the Anchor Road area, Longton, at an estimated cost of £500, and in the Dresden area at an estimated cost of £300. A supply is to be given to the L.M.S. Railway Co. for motive power at Pratts Sidings, Fenton (£250), and to Messrs. Hewitt & Son at their works at Fenton (£250). Negotiations with the Cobridge Brick & Marl Co., with regard to the provision of an additional supply to the company's works at Scotia Bank, have been completed, and the Committee is to provide mains and equipment in connection with a further supply (£1,300). A supply is also to be given to Bradeley (£1,150) and Chell Institute, Tunstall (£1,750).

Surrey.—CHANGE-OVER.—The London and Home Counties J.E.A. has prepared a scheme for the change-over of 34,000 houses in the Cheam, Ewell, Banstead and Worcester Park area to 230-V and 460-V a.c. at a cost of £133,295.

Tring.—REDUCED CHARGE.—Aylesbury Town Council has reduced the flat-rate charge for lighting from 9d. to 8d. per kWh.

Tynemouth.—LOAN.—The Electricity Committee is to seek sanction for a loan of £3,000 for sub-station equipment.

NEW TRANSFORMERS.—Tenders are to be obtained for two transformers to cope with the increasing output of the sub-stations.

Walsall.—REDUCED CHARGES.—Consequent upon larger profits having been made as a result of an exceptional increase in the demand for electricity due to trade improvement, the Electric Supply Committee has decided to make further considerable reductions in charges to all classes of consumers. For power the charge will be 1d. per kWh where the consumption exceeds 500 kWh a quarter. The domestic rate of supply is reduced from 0.7d. to ½d. per kWh, plus a fixed quarterly charge. The concessions will represent a distribution of profits to consumers amounting approximately to £15,000 in a full year.

West Midlands.—EXTENSION OF IRONBRIDGE.—The West Midlands Joint Electricity Authority has decided to act upon the direction of the Central Electricity Board to extend the Ironbridge generating station by the installation of a second 50,000-kW turbo-generator set and boiler plant, and has approved estimates of expenditure amounting to approximately £440,000. The station, which is designed to have an ultimate capacity of 200,000 kW, at present contains 50,000 kW of plant. The first section, which included building and civil engineering work for subsequent extensions, cost £1,140,000, or £22.8 per kW of plant installed. The installation of the second set will reduce the cost to £15.8 per kW. Mr. E. F. Hetherington, M.I.E.E., M.I.Mech.E., the chief engineer and manager to the Authority, will design the plant and supervise its installation.

Traction

Australia.—CABLE ROUTE CONVERSION.—The Melbourne Tramways Board has decided to convert the Brunswick route from cable to electric traction. The estimated cost is £500,000, which includes provision for forty new tramcars and a new depôt. The route is from Elizabeth Street, Melbourne, to the suburb of Brunswick, a distance of 4½ miles. This is the first cable route to be converted since 1930, and the conversion is

One of the new Edinburgh tramcars

made possible owing to the increase in revenue this year. Similar treatment of other routes is likely to be considered shortly.

Barking.—TRAMWAYS TO BE TRANSFERRED TO L.P.T.B.—The London Passenger Transport Tribunal (Mr. Joshua Scholefield, K.C., chairman), recently considered a scheme submitted by the London Passenger Transport Board to transfer Barking tramways to the Board. The scheme was outlined as an agreed scheme, and was placed before the tribunal for its consent, the Corporation not being represented. The chairman said the scheme appeared to be a reasonable and businesslike

one, and as all parties were satisfied there was nothing for the tribunal to do except formally to express consent. The court adjourned until Monday, October 1st, when it will resume the hearing of the claim against the L.P.T.B. by Thomas Tilling, Ltd.—*The Times.*

Leicester.—FUTURE OF TRANSPORT SYSTEM.—The Tramways Committee is considering the future of the system in the city and a change, either to motor omnibuses or trolley buses is likely. Mr. John Mould, the city electrical engineer, has issued a report in which he points out that if motor omnibuses are chosen they will cost £45,000 a year more to run than trolley buses.

Liverpool.—TRACK RENEWAL.—Tramway track within the city is to be renewed at a cost of £38,934.

Middlesbrough.—PROPOSED AMALGAMATION WITH STOCKTON.—Once again negotiations for the merger of the Stockton and Middlesbrough Corporation transport undertakings have failed. Middlesbrough Council advanced the suggestion that the unified control of the two undertakings would be to the mutual benefit of the two towns. Several years ago a proposal for amalgamation was defeated.

South Africa.—CAPE TOWN SCHEME.—The Cape Provincial Council has passed an Ordinance which gives legal sanction to the proposal of the Cape Tramways Co. to abandon the tramways and to substitute trolley buses. In introducing the measure Mr. J. R. Finch said that trolley buses would give increased public safety; they were flexible in movement; and the use of safety zones would no longer be required. The company has still to come to an agreement with the Minister of Railways over another legal difficulty. If this is overcome there will be some fifty trolley buses in operation in Cape Town by March next.

Southampton.—CHANGE OF NAME.—The Tramways Committee has changed its name to the Transport Committee.

Worthing.—CHARGING ELECTRIC VEHICLES.—The Electricity Committee has authorised the engineer to undertake the charging of electric vehicles at the price of 0.625d. per kWh, provided the charging takes place between the hours of 10.30 p.m. and 7 a.m.

Communications

Arctic.—AIRCRAFT RADIO.—In order to be able to report the progress of his flight to America, *via* the Arctic air route, Mr. John Grierson, who is now on the first stages of his flight, is relying on a special Marconi short-wave aircraft installation.

This short-wave transmitter, which has been specially developed for the flight, operates on a wavelength of 34 metres, and when in the air Mr. Grierson transmits an hourly message giving his position and other particulars of his progress. The Radio Society of Great Britain has arranged for its members to listen to Mr. Grierson's transmissions throughout his flight, and on his second stage from Londonderry to Iceland several members of the Society successfully received all his messages until the final one notifying his arrival.

In addition to the wireless transmitter Mr. Grierson's machine is fitted with a Marconi-Robinson "homing" device which enables him to fly accurately to any wireless station on his route, and it also gives him the facility to check his course during the flight. This is particularly valuable in view of the magnetic conditions in the Arctic which frequently render the ordinary compass unsteady and unreliable.

Australia.—WIRELESS LICENCES.—At the end of May the number of wireless receivers' licences in use in Australia had increased to 574,115, an additional 16,692 having been issued during the month. For the twelve months the increase was 25 per cent.

Denmark.—DROUGHT CAUSES BREAKDOWN.—According to *World Radio* transmissions from Kalundborg, the Danish high-power station, have had to be temporarily suspended on several occasions recently owing to lack of electric current. The electric power used by Danish transmitters comes from Malmö, whence it is conducted by cable to the Danish main island, Seeland. The Swedish works use water-power almost exclusively for the production of electricity, and owing to the drought of recent weeks there has been a great decrease in output.

France.—NEW RADIO STATION.—Our Paris correspondent reports that work on the new radio station, Paris Nord, which is situated at Camphin-en-Carembault, near Lille, has been resumed after a delay of many months. The actual building will be completed during this month. Work has also been started on the laying of cables between the studio at Lille, and the station. There are seven pairs of cables altogether, three for ordinary transmissions, two for special transmissions, and two for television.

Germany.—TELEGRAPHIC HOLIDAY SNAPSHOTS.—According to announcements in the German press the telegraphic transmission of pictures has now been extended to the transmission of photographs between members of the public, namely, signed photographs of wedding groups, or for birthday greetings, &c. The telegraphic transmission of snapshots of groups and scenery is also recommended as a sort of picture postcard *de luxe* from holiday makers. "Picture telegrams" are received at all post and telegraph stations in Germany, and the charge for inland (Germany) transmission is only 4 marks (about 4s. at par) for a picture of 100 sq. cm. (15½ sq. in.) area.

Great Britain.—SHORT-WAVE RADIO.—Reports of 5-metre reception at over fifty miles were received as a result of the tests on the Malvern Hills, Worcestershire, on Sunday, July 15th. The transmitters were G5FI, using telephony, and G6YJ, using i.c.w. Both stations employed the *Wireless World* ultra-short wave receiver with great success. Many reports were received within a radius of 50 miles, although the transmitter power was only 4 W, drawn from dry batteries.

Japan.—NEW RADIO STATIONS.—The Navy Office has decided to establish two radio stations, one at Maizuru and the other at Kisarazu, in the Chiba Prefecture, states *Reuter* (Tokyo).

Middlesex.—HOSPITAL RADIO.—The County Council is to modernise the radio installation at the North Middlesex county hospital at an estimated cost of £908.

Radio Navigation in Fog

A DEMONSTRATION of a new radio navigation apparatus developed by the Marchese Marconi and his assistants was arranged to be held at Sestri Levante, near Genoa, on July 30th, in the presence of British and Italian shipowners' organisations. The invention, it is claimed, will enable a master to navigate his ship on a straight line into the most difficult harbour entrance in spite of the worst conditions of visibility.

A transmitter operates on a wavelength of about 60 centimetres and, from experiments which have been made, it appears to be entirely free from interference from any external sources such as atmospherics, rain, fog and electrical or magnetic storms. For the purpose of the demonstration in the Gulf of Genoa one of the new transmitters was installed on the hill behind Sestri Levante, about 300 ft. above sea level, and receiving apparatus was installed on the Marchese Marconi's yacht *Elettra*.

How a Vessel is Guided

Manœuvres can be carried out at any point in the open sea within the useful range of the beacon, which is up to between 20 and 35 miles, depending on the height of the receiver above the water line. All that the navigator has to do is to keep his ship on a course which will maintain the pointer of the dial on the centre line between red and green divisions. Any drift owing to tide or wind is immediately indicated and can be corrected, and experiments have shown that several ships can proceed into harbour one behind the other by this means, the wireless signals not being affected by the fact that other ships are between the transmitter and the receiver.

A method of manipulating the transmitter permits a range-finding system to be incorporated with the oscillating beacon, enabling the navigator to determine his distance from the harbour anywhere within a two-mile limit. To do this the transmitter misses one tone beat every fifteen seconds. The next signal is simultaneously wireless and acoustic, a dash of about one second's duration. The acoustic signal is sent out by a powerful loud speaker oriented in the direction of the harbour entrance line.

On the yacht a sound receiver in the form of a special microphone is tuned to the note sent out by the beacon. By pressing a button as soon as the wireless range signal is heard the headphones of the observer are changed from the wireless to the sound receiver and the time elapsing between the two signals, which can be calculated on a stop watch, is the measure of the distance.

The beacon station at the harbour is quite small—about 6 ft. high and 4 ft. wide. Two small aerials and reflectors are mounted at right angles to each other on a platform forming the top of a cylindrical base. The platform and the aerial system swings left and right continuously about 2 in. from the centre line pointing to the harbour entrance. Each aerial is only a few inches in length with a reflector about 3 ft. in height, consisting of a central metallic rod bent into a true parabola supporting a number of horizontal free-end rods like a bent fishbone.

The basic characteristic of the transmission is the creation in space of a narrow zone of silence at the centre of a purposely wide beam sent by the beacon. The zone of silence swings smoothly about 6 deg. from left to right of the centre line of the harbour channel when the reception is nil and thus nothing is heard by the navigator. If, on the contrary, the ship is off the correct course the change of note becomes perceptible and indicates the deviation. This arrangement detects half a degree of error.

Contract Information

When "Contracts Open" are advertised in our "Official Notice" pages the date of the "Electrical Review" containing the advertisement is given in parentheses below

Contracts Open

Aldershot.—August 10th. Electricity Department. Interior work on consumers' premises in connection with the change-over from d.c. to a.c. (July 20th.)

Argentina.—BUENOS AIRES.—August 13th. State Oilfields. Electrical equipment, consisting of transformers, circuit-breakers and accessories. (A.Y. 12490.)*

Australia.—MELBOURNE.—Posts and Telegraphs Department. September 4th. Telephone tags, connection plates, strips and terminals. (A.Y. 12497.)* Vitreous resistances. (A.Y. 12473.)* Telephone switchboard plugs and sleeves. (A.Y. 12472.)*
September 11th. Telephone instrument cords. (A.Y. 12506.)* Condensers of various capacities. (A.Y. 12500.)*
September 18th. Telephone receivers together with spare ear pieces, &c. (A.Y. 12501.)*

Azores.—PONTA DELGADA.—November 5th. Municipal Council. Hydro-electric plant comprising Francis turbine, 3-phase alternator, oil-cooled transformer, switchgear, &c. (A.Y. 12504.)*

Beckenham.—August 27th. U.D.C. L.p. cable requirements until December 31st, 1934. (July 27th.)

Bedford.—August 20th. Electricity Department. Supply during twelve months of meters, water heaters, cookers, kettles, and other appliances. (July 20th.)

Bournemouth.—August 25th. Corporation. Thirty-six six-wheeled double-deck trolley omnibuses. Specifications from Engineer, Transport Offices, Wootton Gardens (deposit £2 2s.).

Bristol.—September 7th. Electricity Department. Four 130,000-lb. steam raising units. (See this issue.)

Cardiff.—August 25th. Electricity Department. 33-kV cable and metal-clad switchgear, four 15,000-kVA transformers, and lamps. (July 27th.)

Congleton.—August 31st. Electricity Department. One 500-kVA, 3,300/400-V indoor type transformer. (See this issue.)

Douglas.—August 11th. Borough Council. Electrical wiring, &c., in flats in James Street and King Street. Particulars from the borough electrical engineer, Electricity Offices, Ridgeway Street.

East Africa.—MOZAMBIQUE.—October 15th. Port and Railway Administration. Gas producer, motor, alternator, and distribution board. (G.Y. 14075.)*

Egypt.—CAIRO.—August 15th. Ministry of the Interior. Single-phase, single-tariff meters. (A.Y. 12440.)*
August 14th. Materials in connection with the installation of a distribution sub-station at Calioub. (A.Y. 12476.)*

Halifax.—August 8th. Electricity Department. Electric wash-boilers. (July 27th.)
August 15th. Electricity Department. Oil-immersed self-cooled transformers. (See this issue.)

Hastings.—August 15th. Electricity Department. Electricity meter-testing equipment. (July 27th.)

Kesteven.—County Council. Electrical work at Sleaford County Institution. (July 27th.)

Kettering.—August 27th. Electricity Department. Supply and erection of public lamps with extended arms for central suspension. (See this issue.)

Kingston-upon-Thames.—August 4th. Corporation. Vehicle-actuated automatic traffic control signals at Junction of Fairfield West-Knight's Park. Specifications from Borough Surveyor, 3 and 5, Thames Street (deposit £1 1s.).

Lancashire.—August 11th. County Council. Pumps, electric motors and pumping mains at the Mussel purification station, Lytham. Applications to tender to County Architect by July 30th; specifications, bills of quantities, &c., from Office of the County Architect, County Offices, Preston (deposit £2); tenders to Clerk of the County Council, County Offices, Preston.

Louth.—August 14th. Electricity Department. One 500-kVA transformer, 22-kV isolating switchgear and e.h.p. cables. (See this issue.)

Newport (Mon).—August 13th. Electricity Department. Two water-tube boilers, with super-heaters, &c. (July 13th.)

New Zealand.—WELLINGTON.—Post and Telegraphs Department. August 20th. 750 microtelephone handles. (A.Y. 12453.)*
Public Works Department. August 21st. Sixteen 300-W outdoor station lighting fittings. (G.Y. 13999.)*

Oldham.—August 11th. Electricity Department. L.p. cable. (See this issue.)

Reading.—August 27th. Electricity Department. Three 4,000-kVA transformers and 11,000-V metal-clad switchgear. (See this issue.)

Salford.—August 18th. Electricity Department. Mercury-arc rectifier. (See this issue.)

Siam.—BANGKOK.—August 31st. Royal State Railways. Cable and wire. (A.Y. 12489.)*

Sheffield.—September 18th. Electricity Department. Cooling towers and civil and constructional engineering work at Blackburn Meadows generating station, and civil and constructional engineering work at Neepsend power station. (See this issue.)

South Africa.—CAPE TOWN.—Electricity Department. August 29th. 6,000 porcelain weatherproof pole fuses for consumers' service connections. (A.Y. 12499.)*
3,000 single-pole ironclad service cut-outs. (A.Y. 12518.)*
August 22nd. Power, pilot and telephone cables with joint boxes and jointing material. (A.Y. 12509.)*

JOHANNESBURG.—Municipality. August 18th. Black double-braided weatherproof hard-drawn copper conductors for overhead transmission lines. (A.Y. 12496.)*
August 25th. Outdoor type isolating links for the year commencing January 1st, 1935. (A.Y. 12517.)*

PRETORIA.—Government Supplies Board. August 17th. Telephone terminal blocks, indoor-type protectors fitted with carbons and fuses, and plunger or lever hold-down type switches. (A.Y. 12471.)*

Southampton.—August 21st. Electricity Department. One 25,000-kW turbo-alternator and two 160,000-lb. boilers. (July 13th.)

Southend-on-Sea.—September 3rd. Electricity Department. Supply for a period of two years of h.p. and l.p. underground cables. (July 27th.)

Sunderland.—September 3rd. Electricity Department. Paper-insulated cable, rubber-insulated wire, meters and lamps. (See this issue.)

Swansea.—August 17th. Electricity Department. Two batteries, one motor generator and two oxide film metal rectifiers for Tir John power station. (July 27th.)

Swinton & Pendlebury.—August 3rd. Urban District Council. 11-kV, three-phase, seven-panel switchboard for sub-station. Specification from the Council's electrical engineer, Electric House (deposit £1 1s.).

Wallasey.—Electricity Department. Supply, laying and connecting e.h.p. cables. (See this issue.)

West Riding.—Education Committee. Installation of electric lighting, Braithwell Council School. A. J. Dempster, Divisional Clerk, Winchester House, Scot Lane, Doncaster.

Worthing.—August 20th. Corporation. Seven sets of electrically driven, vertical, unchokeable, centrifugal sewage pumps and one centrifugal borehole pump. Specifications from J. Taylor & Sons, Caxton House, Westminster, S.W.1 (deposit £5); tenders to Town Clerk's Office, Town Hall.

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* Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Contracts Closed

Barking.—Electricity Committee. Recommended. Rectifier equipment (£2,516) for Hertford Road sub-station.—Electrical Equipment Co., Ltd. Rectifier equipment for Park Modern sub-station (£1,895).—Hewittic Electric Co., Ltd.

Birkenhead.—Education Committee. Accepted. Electric lighting at central school (£562).—J. Stott & Sons, Ltd.

Blyth.—Town Council. Accepted. Lighting of the Princess Louise Road School (£209).—Blyth Plumbing & Electric Co.

Dundee.—Corporation. Electrical work at 284 houses in two-storey blocks, Graham Street (£1,785).—Stenson & Co.

Eastbourne.—Electricity Committee. Accepted. Street lighting brackets.—Electric Street Lighting Co. Lanterns.—Revo Electric Co., Ltd.

Ilford.—Electricity Committee. Recommended. Transformers. One 500-kVA outdoor type (£242).—Fuller Electrical & Manufacturing Co., Ltd.; three 500-kVA indoor type (£692).—British Electric Transformer Co., Ltd.

Liverpool.—Tramways and Motorbus Committee. Recommended. Fifty car sets, comprising trucks, motors, controllers, brakes, &c. (£57,815).—Electro-Mechanical Brake Co., Ltd.
Electric Power and Lighting Committee. Accepted. 33,000-V cable (£4,903).—British Insulated Cables, Ltd.

London.—SOUTHWARK.—Highways Committee. Recommended Traffic signals at Southwark Bridge Road (£405) and Borough High Street (£615).—Automatic Electric Co., Ltd.
ISLINGTON.—Housing Committee. Recommended. Electrical installation at City and Queen's Mansions (£878).—D. Myer & Co.
POPLAR.—Electricity Committee. Recommended. Switchgear for Emmett Street sub-station (£459).—Metropolitan-Vickers Electrical Co., Ltd.
WANDSWORTH.—Borough Council. Accepted. Traffic signals at four junctions and conversion of existing automatic signals to traffic actuated system.—Automatic Electric Co., Ltd.

Manchester.—Transport Committee. Accepted. Cadmium copper trolley wire.—R. Johnson & Nephew, Ltd.
Electricity Committee. Accepted. High-pressure steam pipes.—Stewarts & Lloyds. Two neutral earthing switch cubicles.—Harland Engineering Co., Ltd. Sub-station kiosk and switchgear, Droylsden.—Ferguson, Pailin, Ltd.

Reigate.—Town Council. Accepted. Electrically driven pumping machinery for the drainage scheme (£4,448).—Gwynnes Pumps, Ltd.

Staffordshire.—Mental Hospitals Board. Accepted. Installation of electrical services for extensions at Burntwood institution (£2,109).—T. Glover.

Stoke-on-Trent.—Markets Committee. Accepted. Electric lighting at Burslem butchers' market (£106).—H. Tams.

Sutton Coldfield.—Electricity Committee. Recommended. Suspension lighting extensions (£2,925).—Simplex Electric Co., Ltd.

Swansea.—Electricity Committee. Accepted. 12,500-kVA static transformer for Tir John power station (£8,100).—Hackbridge Electric Construction Co., Ltd.

Swindon.—Accepted. Education Committee. Electric lighting fittings for Pinehurst schools (£378).—Holophane, Ltd.

Tynemouth.—Town Council. Accepted. Cable (£883).—Macintosh Cable Co. Switchgear (£229).—A. Reyrolle & Co., Ltd.

Wimbledon.—Electricity Committee. Recommended. Cables for nine months.—Metropolitan Electric Cable & Construction Co., Ltd.; Connollys (Blackley), Ltd.; Telegraph Construction & Maintenance Co., Ltd.; Hackbridge Cable Co., Ltd.

Worthing.—Accepted. Cables (£13,690).—Derby Cables, Ltd. E.h.p. cable (£461).—Hackbridge Cable Co., Ltd.
Pier Committee. Accepted. Strip lighting (£180).—Bostel Bros., Ltd. Twenty-two lanterns (£4 5s. each).—Brighton Electrical Engineering Co., Ltd.

Notes

Standard Engineering Symbols

With a view to removing ambiguity the British Standards Institution has prepared a British standard list of engineering symbols and abbreviations. The most frequently used terms in all branches of engineering have been listed, but some which are not in general use or are of limited application have not been included. The list is divided into sixteen sections, and the abbreviations are intended mainly for use in text books and technical papers. The conventional signs used on plans and drawings have not been dealt with. For the most common of these reference should be made to British Standard No. 308—Engineering Drawing Office Practice. Copies of this new British Standard (No. 560-1934) may be obtained from the British Standards Institution, 28, Victoria Street, S.W.1, price 3s. 6d. and 3s. 9d. post free. Recognised educational authorities are offered a 50 per cent. discount on all purchases.

Training in the Use of Light

The equipment of a lighting demonstration room at the London School of Hygiene and Tropical Medicine is an example of the way in which the necessity for increased knowledge of lighting is growing in importance. The room contains several methods of lighting that can be operated separately, and it is used to show post-graduate students and fully qualified doctors the advantages of good lighting and the bearing which light has on economics and health.

A course in lighting practice is now definitely included in

The lighting demonstration room at the London School of Hygiene and Tropical Medicine

the curriculum, and by means of this demonstration room students are able to experiment for themselves in order to determine the best lighting methods for such places as schools, offices and factories, thus obtaining valuable first-hand knowledge.

The Fort Peck Dam, Montana

Fort Peck Dam, the large Federal project on the Missouri River in Montana, will be one of the largest earth-filled barriers ever built. The initial stages of construction have already been commenced and, when finished, the dam will create a reservoir 175 miles long and have cost about $72,000,000. The total length of the dam, including wings, will be nearly four miles and the height 230 ft.; it will be 100 ft. wide at the top and 2,658 ft. at its base. Its purpose is to provide a 9-ft. channel in the Missouri River throughout the year, aid in flood control, provide unemployment relief, and furnish a site for power development. It is estimated that four years will be required for construction.

The Electrical Concierge

The *concierge* (French door-keeper) who lives on the ground floor of all French apartment houses, is likely to be replaced by an electrical apparatus. It is the business of the *concierge* to let callers in and to direct them to the apartments where their friends are living. The new apparatus consists of microphones and loud speakers situated throughout the apartments and on the outside of the building. The caller announces himself through the microphone and his voice is carried into the building. If the person he wishes to visit is at home he answers the caller from his microphone, which is situated on his landing. There will be one loud speaker and one microphone for each floor. This seems to be a suitable substitute for a radio set.

A New Angle Plug for Refrigerators

Ordinarily, an electric refrigerator cannot be set up close to a wall because the conventional type of plug projects too far from the outlet behind the refrigerator. To overcome this difficulty a new all-rubber angle plug has been developed by the Merchandise Department of the General Electric Co. of New York, with the prongs projecting at right angles to the cord. A shallow design is attained, since the contact prongs and leads are moulded in rubber. Its unit construction assures a long, serviceable life. Another new development is a cord set with the rubber connector body moulded on the cord, which provides a one-piece construction instead of the conventional three-piece construction. The long neck of the connector acts as a strain relief.

The Walsall Appointment

The Walsall Corporation Electricity Committee has reported to the Town Council that, after having considered sixty-five applications for the post of manager of the electricity undertaking, it cannot recommend anyone for the post, and has recommended the General Purposes Committee to re-advertise the position at a higher salary. The original salary offered for the post was £600 per annum, rising to £750, and the Electrical Power Engineers' Association and the Associated Municipal Electrical Engineers requested their members not to apply. The salary now to be offered is £800 rising to £1,100.

Furnace Temperature Control

In our last issue (p. 117) we described a method of using vacuum tubes for controlling the temperature of an annealing furnace. This method enables the temperature to be maintained constant at 800 deg. C. with a tolerance of ±2 deg.

An Electron Microscope

The basic limit imposed upon the power of ordinary microscopes is determined by the wavelength of the light employed; if the bacteria or other object examined is smaller than about 0.0005 mm. it cannot be investigated by visible light. This limitation is overcome by the electron microscope which, according to *Hamburger Nachrichten*, has been so perfected in Berlin to the extent that it is now applicable to biological and medical purposes as well as to the examination of the surfaces of metals.

Electron emissions from a heated filament are focused by condenser plates or electromagnets, and the object is impregnated with metal to provide a framework capable of withstanding the heating effect of the electron stream. It is claimed that the results already secured represent the first step towards a further insight into the smallest forms of life.

Railway Electrification in Austria

An association for furthering railway electrification in Austria has been formed recently. The president is Dr. Seefehlner, a former general manager of the Austrian Federal Railways, and in a booklet just issued to the public he quotes the speech of Mr. G. W. E. Loder (now Lord Wakehurst of Ardingley) at the last annual meeting of the Southern Railway, as showing the benefits which railway electrification confers on the ordinary traveller.

The Whitworth Society

The annual meeting of the Whitworth Society was held at Leamington Spa and Coventry on July 17th and 18th. Members assembled at the Regent Hotel, Leamington, for an informal dinner on the evening of the 17th and the next morning visited the works of the Lockheed Brake Co. The party then proceeded to Coventry, where the annual luncheon was held at the Chace Hotel, Willenhall. In the course of this function the retiring president, Mr. E. R. Dolby, vacated the chair and inducted the new president, Mr. Charles Day. The works of the Daimler Company, Ltd., were then visited and tea was provided by the company. The meeting was attended by about forty members. The address of the Whitworth Society is at the offices of the Institution of Mechanical Engineers, Storey's Gate, S.W.1.

The Professional Classes Aid Council

This Council's report for the year ended April 30th last (the thirteenth) shows that following upon a large deficit in the preceding year there was a further and larger adverse balance. Although there was an increase in receipts the number of calls for assistance was again very large. The total amounted to 1,345, and of these 311 cases were given financial or other assistance. In the majority of the rest of the cases helpful advice was given. The accounts for the year record a total income of £12,627 and an expenditure of £14,308—an adverse balance of £1,681.

Makers' Names Wanted

CURTIS X-ray reflector lamp.
AGA Swedish system of searchlights.
ZEDRAY heating pad.
VORTEX bilge pumps.

Our Personal Column

Electrical men are invited to keep readers of the "Electrical Review" posted concerning their movements

Mr. A. T. Bullen, the author of the article on "Electricity Supply Values," which appears on page 143, was educated at Peter Lymonds School, Winchester, and Hartley University College, Southampton, where he took the electrical engineering course. He served for one year in the meter and instrument section of the British Thomson-Houston Co., Ltd., and subsequently occupied positions in Fulham Borough Council Electricity Department, the Guildford Electric Supply Co., and Stoke-on-Trent Electricity Department, before going to Bedford as mains superintendent. He was appointed engineer and manager of the Welwyn Garden City Electricity Supply Co., Ltd., in January, 1930. He became an A.M.I.E.E. in 1919, and was made a full member this year. He has been secretary and chairman of the Bedford section of the E.P.E.A., and served on the employés' side of the No. 9 Area District Joint Board and N.J.B. Since going to Welwyn he has served as employers' representative on the No. 9 Area District Joint Industrial Council and District Joint Board.

Mr. D. F. Grant, assistant station superintendent with the Maidstone electricity undertaking, has been appointed station superintendent to the Southport Corporation Electricity Department.

Mr. W. C. P. Tapper, who has retired from the position of consulting engineer and manager of the Stepney electricity undertaking, was the subject of a resolution of appreciation which was unanimously carried at last week's meeting of the Borough Council. A similar resolution was read at the meeting from the Bethnal Green Borough Council, whose electricity undertaking has been linked with the Stepney undertaking for the last eighteen years.

Mr. A. E. Campbell, deputy electrical engineer to the Stepney Borough Council, has been appointed borough electrical engineer to the Council. Mr. Campbell received his technical training at the Cannock Science School, Walsall Science and Art College, and Wolverhampton Science and Art Institute, and served his apprenticeship in the mechanical and electrical departments of Littleton Collieries, Ltd. He was appointed shift engineer at the Summer Lane station of the Birmingham Electric Supply Department in 1910, and while at Birmingham held the successive appointments of switchboard attendant, Summer Lane station; shift engineer, Chester Street station; senior shift engineer and assistant resident engineer, Summer Lane; assistant resident engineer, Princes Street station; Constructional Department and mechanical and electrical engineer, Hams Hall station; resident engineer, Hams Hall; and from 1930-33, senior resident engineer. He was responsible for the erection, testing, and putting into operation of the new Hams Hall power station. In September, 1933, he went to Stepney as deputy electrical engineer, and took complete charge of the undertaking in October when Mr. Tapper, the borough electrical engineer, was ill. He has organised and put into operation the free domestic hire scheme, and has put in during the first six months of the current year 1,000 complete installations, consisting of cookers, washboilers, irons, kettles and fires.

[H. J. Whitlock & Sons, Ltd.

Mr. A. E. Campbell

Mr. H. N. Baker, M.I.E.E., M.I.Mech.E., district manager of the British National Electrics, Ltd., and engineer in the municipal engineering section, London area, Metropolitan-Vickers Electrical Co., Ltd., has been appointed station superintendent at the Limehouse generating station of the Stepney Borough Council.

Mr. L. Raven, assistant sales engineer to the Manchester Corporation, has been appointed sales service engineer to the Wallasey Electricity Department, and **Miss H. G. Holding,** cooking demonstrator to the Liverpool Corporation, has been appointed cooking demonstrator and showroom assistant.

Mr. George Phillipson states that the Rochdale Passenger Transport Committee has dispensed with his services as overhead equipment superintendent, which position he has held since 1908, in consequence of the substitution of buses for tramways.

Sir John Reith is sailing for Cape Town early in September, and during his two months' stay in South Africa he will advise the Government on questions of broadcasting developments.

Mr. E. H. Barrenger has retired from the post of secretary of the London Electricity Supply Association, in consequence of increasing duties attributable to the continued expansion of business in the area of the St. James' & Pall Mall Electric Light Co., Ltd., with which company he has been connected for the past thirty-three years, seven years as assistant secretary and for the past thirteen years as secretary. In accepting his resignation, the members of the Association have placed on record their appreciation of the manner in which he has devoted himself to the affairs of the Association since he assumed the office of secretary in 1926, and their regret at the loss of his services and also those of his staff in the employ of the St. James' Co. who have assisted him in his work on behalf of the Association. The Association has asked Mr. Barrenger to retain office until the end of the month as acting secretary, until a successor is appointed. He will remain a member of the Association, as one of the two representatives of the St. James' Company, and as joint hon. secretary (with Mr. L. Gordon) of the Joint Committee of the London and Home Counties Joint Electricity Authority and certain of the West End London supply undertakings. Mr. Barrenger wishes to thank all those who have co-operated with him during his term of office.

[Vandyk Studios

Mr. E. H. Barrenger

Mr. D. S. Parry (not Barry) has been appointed head of the Sales and Estimating Department of Switchgear & Cowans, Ltd. We regret that his name was incorrectly given in the notice as well as under the photograph published in our last issue.

Mr. H. G. Jeken, transport manager at Middlesbrough, has terminated his appointment with the Corporation, following the expiry of his notice given three months ago. At a recent meeting of the Transport Committee it was decided that Mr. Jeken should be allowed to retain his post temporarily until a new manager was appointed or some agreement was reached with Stockton Corporation regarding a proposal to amalgamate the two undertakings. Mr. Jeken, however, laid down certain conditions which the Committee decided were not acceptable, and they were rejected.

Mr. H. Midgley, chief technical assistant to Mr. P. J. Robinson, the Liverpool city electrical engineer, has been appointed city electrical engineer at Plymouth at a salary of £1,000, rising to £1,400. Mr. Midgley served his apprenticeship in the shops and drawing office of Messrs. R. & W. Hawthorn, Leslie & Co., Newcastle-on-Tyne, and attended Armstrong College, Durham University. During the war he was chief draughtsman and deputy works manager of the Aeroplane Department of Sir W. G. Armstrong, Whitworth & Co., following which he became principal assistant in the General Engineering Department of the Metropolitan-Vickers Electrical Co., Ltd., at Trafford Park, Manchester. He joined the Liverpool Electric Supply Department in January, 1922, as constructional engineer in connection with the erection of the Lister Drive No. 3 power station. When Mr. Robinson succeeded the late Mr. H. Dickinson as city electrical engineer in 1927, Mr. Midgley became his chief technical assistant, in which capacity he not only acted as constructional engineer in connection with the erection of the Clarence Dock station, but also as his assistant for all sections of the work of the Department. He holds the degree of B.Sc. (Eng.), University of Durham, and was granted the M.Sc. (Eng.) degree by the University of London for a thesis on "The Effect of Power Station Design on Running Costs." He is an associate mem-

Mr. H. Midgley

ber of the Institution of Civil Engineers, and a member of the I.E.E.

City and Guilds Fellowships.—The Council of the City and Guilds of London Institute has conferred the distinction of Fellow of the Institute (F.C.G.I.) upon Messrs. H. L. Armstrong, J. M. Barr, M.I.E.E., S. Lacey, B. Price, M.I.E.E., and E. F. D. Witchell.

Mr. J. M. Kennedy, having been appointed an Electricity Commissioner, has ceased to be a partner in the firm of Kennedy & Donkin. The firm will continue their practice as consulting engineers under the same name and with the same staff.

Miss Joan Fright has resigned her position as cookery demonstrator in the Ealing Corporation Electricity Department to join the demonstrating staff of the Westminster Electric Supply Corporation, Ltd.

Miss Philippa Hunter, daughter of Mr. P. V. Hunter, was to be married to Mr. Anthony Jessel at St. Clement Danes Church, London, yesterday (Thursday).

Mr. J. S. Elliott, Assoc. I.E.E., late of the Ealing Corporation Electricity Department, has joined the staff of Messrs. Hoover, Ltd., as inspector in the Engineering Department.

Mr. H. J. R. Clark has been appointed by the Hull Corporation Electricity Committee as mechanical maintenance engineer at a salary of £487 per annum.

I.E.E. Scholarships.—The following scholarships have been awarded by the Institution of Electrical Engineers for 1934:—Ferranti Scholarship: Mr. F. C. Williams, M.Sc. Duddell Scholarship: Mr. S. I. Hollingworth. Silvanus Thompson Scholarship: Mr. S. G. Bittles. Swan Memorial Scholarship: Mr. E. Bradshaw, M.Sc. David Hughes Scholarship: Mr. W. B. Hutchison. Salomons Scholarships: Messrs. R. Bernard and W. McStravick. War Thanksgiving Education and Research Fund (No. 1): Grants of £50 each to Messrs. R. R. C. Rankin and H. Walton. Thorrowgood Scholarship: Mr. K. N. Fordham.

Nikola Tesla, the well-known American electrical pioneer and inventor, is seventy-eight years of age. A New York contemporary says that a few weeks ago he announced a number of new inventions, including an electrical projection beam carrying minute physical particles at high velocity; by such beams he claimed that armies and aeroplanes could be shot down at distances up to 200 miles. He promised to make the details public shortly.

Obituary

Dr. H. J. Ryan.—The death on July 4th of Dr. Harris J. Ryan is reported from America. Dr. Ryan, who was sixty-eight years of age, retired three years ago from his position as head of the Electrical Engineering Department of Stanford University, where he had been for twenty-six years, with a view to devoting his attention entirely to electrical research, with especial reference to practical applications. The modern high-voltage laboratory equipped by the University in 1926 was called by his name. There he conducted experiments relating to the production and control of artificial lightning and corona effects, &c., on transmission lines. He was one of the earliest to recognise the value of the cathode-ray tube for studying high-voltage effects, and was awarded the Edison Medal in 1925 for his work on high-voltage transmission. Dr. Ryan had been president of the American Institute of Electrical Engineers, and was a member of the American Association for the Advancement of Science and of the American Society of Mechanical Engineers.

Mr. H. V. Morris, for many years London manager for Messrs. F. & C. Osler, Ltd., died on July 22nd in his eighty-fourth year. He had been associated with the firm for more than fifty years, and retired from active business in 1921.

Mr. H. Whitley-Smith.—The death occurred last week at Camberley, at the age of seventy-six, of Mr. Henry Whitley-Smith, C.I.E., late of the Telegraph Service, Government of India.

Sig. Ing. E. De Strens.—The death recently occurred in Milan, at the age of seventy-four years, of Signor Ing. Emilio De Strens. Although a Belgian by birth, the deceased was educated in Italy and became one of the pioneers of electric lighting in that country. He obtained, as long ago as 1885, a concession for the electric lighting of the central part of the city of Turin. Later, he became associated with the Italian branch of Babcock & Wilcox.

Financial Section

New Companies, Returns of Share Capital, Debenture Charges, Reports of Electrical Companies, Dividend Changes, Transactions in Stocks and Shares

New Companies Registered

A. H. Webb (London), Ltd.—Private company. Registered July 21st. Capital, £500 in £1 shares. Objects: To carry on the business of manufacturers and repairers of and dealers in dynamos, motors, armatures, magnetos, batteries, conductors, insulators, &c. The directors are: G. I. Harris and A. H. Webb, both of 40, Brent Park Road, Hendon, N.W.4. Registered office: 40, Brent Park Road, Hendon, N.W.4.

General Wireless Relay Co., Ltd.—Public company. Registered July 23rd. Nominal capital, £25,000 in 20,000 6½ per cent. cumulative preference shares of £1 and 100,000 ordinary shares of 1s. each. Objects: To enter into two agreements with Universal Wireless Relay, Ltd., and to carry on the business of erecting equipment and working wireless broadcast relay stations, amplifying stations and the like, &c. The first directors are: Lt.-Col. E. H. R. Thackwell, Regent Palace Hotel, W.1, and two others. Secretary: W. B. Pearson. Registered office: Polebrook House, Golden Square, W.1.

Neon Ray Slimmer, Ltd.—Private company. Registered July 25th. Capital, £1,000 in £1 shares. Objects: To carry on the business of electricians, mechanical engineers and manufacturers, &c. The subscribers are: G. K. Goddard, 237, Valley Road, Streatham, S.W.16; and C. W. B. Pinches, 196, St. Paul's Road, Canonbury, N.1. Solicitors: Heald, Johnson & Co., 118/120, Wardour Street, W.1.

R. A. Lister (Marine Sales), Ltd.—Private company. Registered July 23rd with a nominal capital of £5,000 in £1 shares. Objects: To acquire the selling rights of and conduct the sale of all such marine propulsion and auxiliary engines, machinery and equipment as from time to time manufactured by R. A. Lister & Co., Ltd., and to carry on the business of mechanical, electrical, consulting, motor, marine and general engineers, &c. The directors are: A. A. Lister, Basing House, Branksome Park, Bournemouth; R. B. Lister, "Longacres," Cam, near Dursley, Glos; and A. C. Lister, "The Crossways," Rodborough, Glos (directors of R. A. Lister & Co., Ltd.). Secretary: H. Gill. Registered office: The Priory, Dursley, Glos.

J. Bramwell & Son, Ltd.—Private company. Registered July 23rd. Capital, £300 in £1 shares. Objects: To carry on the business of electrical and mechanical engineers, manufacturers of and dealers in electrical and mechanical instruments, wireless sets, &c. The subscribers are: J. Bramwell and Mrs. Fanny Bramwell, both of 239, Abbeydale Road, Sheffield. Registered office: 239, Abbeydale Road, Sheffield.

Metcalf Electrics, Ltd.—Private company. Registered July 28th. Capital, £500 in 200 preference and 300 ordinary shares of £1. Objects: To acquire the business of a wireless and electrical dealer and engineer carried on by Harry Metcalf at 26, York Place, Leeds. The permanent directors are: H. Metcalf, 21, Balbec Avenue, Headingley, Leeds, and L. Metcalf, 9, Highfield Road, Bramley, Leeds. Registered office: 26, York Place, Leeds.

Kolhapur Hydro-Electric & Aluminium Co., Ltd.—Private company. Registered July 27th. Nominal capital, £100 in £1 shares. Objects: To acquire the benefit of a charter granted by the Maharajahsahib of Kolhapur; and to adopt an agreement with A. H. Redfern and A. R. Thomas, to acquire any mines, mining rights, concessions or lands containing aluminium, gold, silver, tin, precious stones, or other valuable products, and to carry on the business of electrical engineers and contractors, miners, &c. The subscribers are: C. R. Churchill, 5, Armitage Road, N.W.11, and S. Kinnear, 3, Springall Street, S.E.15. Registered office: 17, Victoria Street, S.W.1.

Returns of Electrical Companies

Burgoyne Wireless (1930), Ltd.—Mortgage dated June 26th, 1934, to secure £6,000 charged on land at the corner of Great West Road and Ealing Road, Ealing, with the factory erected thereon. Holders: Allnatt Holding Co., Ltd., 109, Kingsway, W.C.2.

A. E. Shearing, Ltd.—W. E. Thorpe, of 5, John Street, Bedford Row, W.C.1, ceased to act as receiver and manager on July 14th, 1934.

Pneumode, Ltd.—Capital, £20,000 in 10,000 6 per cent. cumulative preference and 10,000 ordinary shares of £1 each. Return dated October 20th, 1933 (filed May 24th, 1934). 10,000 preference and 10,000 ordinary shares taken up. £10,100 paid. £9,900 considered as paid. Mortgages and charges, nil.

Baker & Hyman, Ltd.—Capital, £2,000 in £1 shares. Return dated March 2nd, 1934. All shares taken up. £15 paid. £1,985 considered as paid. Mortgages and charges, nil.

Southern Areas Electric Corporation, Ltd.—The nominal capital has been increased by the addition of £100,000 in £1 ordinary shares beyond the registered capital of £250,000.

General Accessories Co., Ltd.—Debenture dated July 13th, 1934, to secure £10,000 and further advances not exceeding therewith £12,500, charged on the company's undertaking and property, present and future, including uncalled capital. Holders: Lloyds Bank, Ltd.

Automatic Coil Winder and Electrical Equipment Co., Ltd.—Debenture dated June 29th, 1934, to secure £5,000, charged on the company's undertaking and property, present and future, including uncalled capital. Holders, Westminster Bank, Ltd.

Vinces Dry Batteries, Ltd.—Satisfaction on July 4th, 1934, of charge to Barclays Bank, Ltd., dated August 1st, 1933, and registered August 22nd, 1933. (According to the register of mortgages, the charge registered August 22nd, 1933, originally secured all moneys due to bank.)

Arun Engineering Co., Ltd.—F. J. Willmott, of Central Chambers, The Broadway, Haywards Heath, ceased to act as receiver and manager on July 16th, 1934.

London Magneto Repairing & Winding Co., Ltd.—Mortgage dated July 19th, 1934, to secure £2,250, charged on 78, Hampstead Road, N.W. Holders: Portman Building Society.

Stearn Electric Co., Ltd.—Particulars filed of debentures not exceeding £20,000 authorised July 2nd, 1934, charged on the company's undertaking and property, present and future, including uncalled capital, the amount of the present issue being £18,200.

Power Centre Co., Ltd.—F. J. Blythe, Coopers Buildings, Church Street, Liverpool, was appointed receiver and manager on July 19th, 1934, under powers contained in debenture dated June 6th, 1931.

Lewes & District Electric Supply Co., Ltd.—The nominal capital has been increased by the addition of £10,000 in £1 ordinary shares beyond the registered capital of £50,000. The 5,000 ordinary shares of £10 in the original capital have been sub-divided into 50,000 ordinary shares each.

C. H. Brook, Ltd.—Capital, £1,000 in £1 shares. Return dated December 29th, 1933 (filed June 9th, 1934). All shares taken up. £1,000 paid. Mortgages and charges, nil.

Torque Transformer Syndicate, Ltd.—Capital, £2,400 in £1 shares. Return dated January 14th (filed May 3rd), 1934. 2,200 shares taken up. £2,200 paid. Mortgages and charges nil.

Hellesens, Ltd.—Capital, £160,000 in 112,000 "A" and 48,000 "B" shares of £1 each. Return dated July 5th, 1934. All shares taken up. £160,000 paid. Mortgages and charges: £30,000 (bank overdraft).

E. P. Cottier, Ltd.—Capital, £1,000 in £1 shares. Return dated December 28th, 1933 (filed May 1st, 1934). 650 shares taken up. £650 paid. Mortgages and charges nil.

Electric Sign Co., Ltd.—Capital, £2,000 in £1 shares. Return dated November 14th, 1933 (filed April 24th, 1934). All shares taken up. £1,000 paid. £1,000 considered as paid. Mortgages and charges nil.

Perivale Engineering Co., Ltd.—The nominal capital has been increased by the addition of £10,000 in £1 ordinary shares beyond the registered capital of £15,000.

City Notes

The Victoria Falls & Transvaal Power Co., Ltd.—Presiding at the annual meeting on July 26th Mr. A. E. Hadley (chairman and managing director) said that at the last two annual meetings the chairman had indicated that a modification of the company's charges was under consideration. Negotiations had now been completed between the mining industry and the company which met with the approval of the consumers and were satisfactory to the company. The agreements for the sale of power had been extended from 1942 to 1950 and provided that the charges varied up or down according to whether the results were greater or less than those for 1933. That arrangement, although involving a reduction in profits for the year 1933, added considerably to the stability of the business by providing supply on terms which were satisfactory to existing and prospective consumers. In the year 1933 the electricity sold showed a satisfactory increase over the previous year, and the increase was continuing during the current year. As a result of the increasing demands for power from mining groups, of which approximately 70,000 kW had still to be met, large extensions of plant were decided upon, and a station, which would be known as the Klip station, had been designed for an original capacity of 100,000 kW, and an ultimate capacity of 350,000 kW. The main contracts for its construction had already been placed. Owing to mining activities outside the company's area of supply, an agreement had been come to between the company and the Electricity Supply Commission under which the Commission would own the new Klip station, which the company would operate, and take the entire output at cost price, including the Commission's capital charges and certain administration expenses. The Commission would obtain and cede to the company the licence for supplying the new areas, and the company would also operate all the Commission's transmission system in such areas. The power requirements during the current year were being satisfactorily met and continued to increase, the energy sold during the first six months showing an increase of about 10 per cent. over the corresponding period of last year.

Falk, Stadelmann & Co., Ltd.—Presiding at the annual meeting held on July 26th Mr. Max Falk (chairman) said that the trade revival, and the consequent greater demand for the goods manufactured and distributed by them made itself felt only in the latter part of the period under review. Competition for business remained intensive in many of the classes of goods handled by them, resulting in a number of cases in uneconomic price levels. To meet this they had taken steps wherever possible, to reduce operating expenses without adversely affecting efficiency. The trading profits had not benefited by their operations in the overseas markets. Particularly in Australia and New Zealand, the adverse exchange position and increasing local productions, as well as Japanese competition, made themselves felt. Conditions in South Africa had improved appreciably, but the change took place too late to affect the accounts under review. In recent months there had been an appreciable increase in the demand for the products of their electric light fittings works at Birmingham, and contracts included the provision of the whole of the lighting fixtures for the Manchester Central Library. Their Rainhill works had developed some new types of electrical cooking apparatus and their electrical cable works had now a full year's working behind them. It had been necessary to lay down additional plant, and further extensions were in hand which would enable them to deal with a still greater output. This scheme necessitated the erection of additional factory buildings on the freehold property owned by them. A subsidiary, engaged mainly in the design and erection of overhead transmission lines, having completed the larger contracts entrusted to it by the Central Electricity Board, had obtained from various electricity undertakings a fair share of contracts for the extensions arising out of the main schemes. They had acquired a controlling interest in one of the oldest manufacturing concerns, which had designed and carried out important neon installations.

The Jerusalem Electric & Public Service Corporation, Ltd., held its annual meeting in Jerusalem on July 25th, when Mr. L. Le Bouvier (local director), who presided, said that further progress had been made during the year under review, the number of consumers increasing from 5,000 to 6,172; this increase was due in part to the influx of emigrants from Europe, but mainly to the success of the tariff reductions which took place in October. In addition, an increase had taken place in the street lighting and fifty new lamps had been installed. During the year they had made a reduction in the charge for water heating at night and as soon as the advantages of this facility were known it was hoped that good business would result. The extension to Ramallah had proved valuable and load was coming on satisfactorily and would include a supply to the new broadcasting station. The increase in load during the current year had necessitated a further review of the capacity of the generating station, and the installation of further plant had been ordered which should be ready in time for the winter requirements. During the year 8,000 preference shares of £P.1 each and 17,000 ordinary shares of £P.1 each were issued in order to provide funds for the new plant and for general development of their business. Considerable building activity was taking place in Jerusalem, and general conditions in the city and surrounding district indicated that a further substantial demand for electricity might be anticipated.

The North Wales Power Co. has informed holders of the 4½ per cent. guaranteed debenture stock, 1930-1953, that it will repay the whole of the outstanding issue on November 1st next at par, on which date the final six months' interest payment will be made. Holders of the stock are invited to exchange their holdings into an equal amount of 3½ per cent. guaranteed debenture stock 1946-53, of which £1,468,100 is being issued. The guarantee of the Government under the Trade Facilities Acts is extended to the new stock, which is repayable over the years 1935-1953 by the operation of a cumulative sinking fund. A full six months' interest on the new stock will be paid on May 1st next.

Christy Bros. & Co., Ltd., are again paying a dividend of 10 per cent., less tax, on the ordinary shares for the year ended March 31st last. General reserve receives £10,000, superannuation fund £1,000, and a balance of £20,028 is carried forward.

The Lancashire Electric Light & Power Co. has declared an interim dividend of 2½ per cent. on the ordinary shares (unchanged).

The Bournemouth & Poole Electricity Supply Co., Ltd., has declared an interim dividend of 6 per cent. (same) on the ordinary shares.

The South London Electric Supply Corporation, Ltd., has announced an interim dividend of 3 per cent. (same) on the ordinary shares.

The County of London Electric Supply Co., Ltd., is paying an interim ordinary dividend of 3 per cent. (unchanged).

The Bristol Tramways & Carriage Co., Ltd., has announced an interim ordinary dividend of 2 per cent., less tax.

Enfield Cable Works, Ltd., is maintaining its interim dividend at 10 per cent.

The City of London Electric Lighting Co., Ltd., has declared an interim dividend of 8.4d. per share on the ordinary shares.

The Charing Cross Electricity Supply Co., Ltd., has announced an interim ordinary dividend of 3½ per cent.

The Richmond (Surrey) Electric Light & Power Co., Ltd., is maintaining its interim ordinary dividend at 4 per cent.

Stocks and Shares

TUESDAY EVENING.

STOCK Exchange markets enter upon the holiday month in a mood of appropriate languor. Prices are dull in most markets where anything in the nature of a speculative account prevails. The gilt-edged sections maintain most of their firmness. Some of the prior-charge stocks in the Home Railway group have gone back, by reason of disappointment caused by the Southern Railway's dividend announcement. American utility stocks suffered with others in the dollar lists: there was a slump in Wall Street last week, nor did the usual subsequent recovery replace the full extent of the losses. The Cables & Wireless market leans towards dullness. Continental politics are quoted as a general reason for whatever weakness is shown by the prices of securities, whether investment or speculative in character.

Transport and Railways

Expectation looks for this week to produce the anxiously awaited declaration of the interim dividend on London Passenger Transport C stock. In advance of the statement, the price fell 2 points to 78¾. Other issues of the Transport Board have been very steady. For the 5 per cent. "B" stock buyers came forward at 121. Central Electricity stocks are unchanged. It was jocularly reported in the Stock Exchange last Monday morning that the market in these stocks had suffered in no way by the partial failure of the grid on the preceding day.

The pre-ordinary stocks of the Home Railway companies have come down by reason of disappointment with the Southern Railway's interim dividend. It had been thought that the Board would distribute a modest dividend on the company's 5 per cent. preferred stock, but the directors followed the same course as that of a year ago and postponed any payment in respect of the first six months of the year. The figures, however, exhibit satisfactory improvement upon

those of last year. Mr. Neville Chamberlain declares that the recovery in the industrial sphere in Great Britain is unparalleled in its extent and rapidity throughout history. "It has been a recovery against the tide," says the Chancellor of the Exchequer.

Electricity Supply Shares

Further dividend announcements from the London Electricity supply companies are at the usual rates and have had no effect upon prices in the market for the shares. Westminster ordinary have strengthened to 34s. 6d. The new County of London 4 per cent. preference are in request at 3d. premium: they can still be obtained free of stamp and fee. The yield is no more than 3¾ per cent. on the money. Very few of the preference shares in the group of electricity supply companies, London or provincial, offer a return of 4 per cent. on the money. Most of them pay about 3⅛ per cent.

Cables and Wireless

The trio of Cables & Wireless stocks remains out of favour. Prices are a little lower and the market is neglected and dull. The Canadian Marconi report, published the other day, states that the company has arrived at a satisfactory agreement with Cables & Wireless. This arrangement is to run from the beginning of the current year until March, 1953. The new plan should be of service in effecting economies for both undertakings.

Great Northern Telegraphs, after rallying to 36, slipped back again to 35. The murder of Dr. Dollfuss led to sales of shares in various companies popular on the Continent. Great Northern Telegraphs have a wide proprietary in Denmark and in Paris. Anglo-American Telegraph deferred is 10s. lower at 27.

The American Slump

Following upon a period of weak prices, the Wall Street Stock Exchange developed a mild slump towards the end of last week. Private advices from the United States, and the testimony of Americans now on a visit to this country, go to show that confidence is far from being generally felt in the States as to the business outlook. The labour disturbances are said to have aimed a serious blow at various branches of trade and industry. Reaction to this sentiment is seen in the falls that have occurred in Canadian, as well as American utility descriptions. Losses are shown in Montreal Light & Power at 32¾, Shawinigans at 19½, ex 13 cents dividend, and Power Corporation of Canada at 8½. The last-named has fallen 1½. Brazilian Tractions dropped to 8. American Telephone & Telegraph at 109½ is 3 points down. Internationals at 8½ are 2½ lower on the week.

Victoria Falls

Victoria Falls ordinary shares have risen 5s. to 6¾ on the meeting held last week, when the chairman presented a programme of future development which, from the shareholders' point of view, gives the promise of continued prosperity to the company. The preference shares, which are entitled to 6 per cent. dividend but participate to the extent of a further 4 per cent., have hardened to 4ls. The full 10 per cent. has been paid annually for some years past on these preference shares, but, as mentioned here on previous occasions, the Union of South Africa Government has the right to give, in 1948, two years' notice of intention to expropriate the undertaking. If this should be done, the preference shares would be paid off at their par value of 20s. At last week's meeting, the impression left on the minds of some of those present was that this expropriation might not take place. But nobody can say anything for certain at the present stage.

Manufacturing and Equipment

Handsome contracts for plant have been recently placed by the Victoria Falls & Transvaal Power Company and by the Southern Railway, amongst other large concerns. The Stock Exchange market for shares in the manufacturing group is, however, irresponsive to the business now being offered to the equipment companies. Associated Electrical Industries ordinary shares have eased off to 18s. Johnson & Phillips are a trifle lower at 22s. Enfield Cables have hardened to 87s. 6d. The other "heavy" shares have held their previous prices.

Miscellaneous Matters

The Southern Areas Electric Corporation is about to offer its shareholders 110,500 ordinary shares at 22s. One new share can be subscribed for every two shares at present held. The price of the latter is about 22s. 6d., so the offer cannot be deemed much of a bonus. British Electric Traction deferred retains its 50 points rise of last week: Tilling & British Automobile Traction, which is partly controlled by the B.E.T., has increased its interim dividend by one per cent., to 5 per cent., and proposes to issue bonus shares to the holders of ordinary shares.

Kent Electric Power 4½ per cent. debenture stock has risen 2½, to 109. Bournemouth & Poole debenture scrip at 1⅛ premium is ¼ better. Galloway new debenture, with £50 paid, has improved to 5½ premium. An order for the purchase of 15,000 Electric & Musical Industries shares served to hold the price steady at 25s. The iron and steel list is little changed. Babcocks at 42s. 6d. are a few pence down. Rubber, the commodity, moved up to 7½d. per lb. without arousing any new interest in the market for rubber shares.

Share List of Electrical Companies

	Nom.	Dividend. 1932.	Dividend. 1933.	Price. July 31.	Rise or Fall.	Yield. p.c. £ s. d.
Home Electricity Companies.						
Bournemouth and Poole	1	15	15	77/6	—	3 17 2
Brompton Ordinary	1	7	7	34/-	—	4 2 4
Charing Cross Ordinary	1	7	7	34/-	—	4 2 4
Chelsea	1	7	7	34/-	—	4 2 4
City of London	1	7½	7½	35/-	—	4 5 9
Clyde Valley	1	7	7	40/-	—	3 10 0
County of London	1	10½	10½	57/6	—	3 13 1
Edmundson's 7% Pref.	1	7	7	34/-	—	4 2 4
Elec. Dis. Yorkshire	1	9	9	47/-	—	3 16 6
Elec. Supply Corporation ...	1	11	11	59/6	—	3 13 10
Kensington Ordinary	1	7	7	34/-	—	4 2 4
Lancs Light and Power	1	7	7½	37/6	—	4 0 0
London Electric	1	7	7	34/6	—	4 1 2
Metropolitan	1	10	10	52/6	—	3 16 2
Midland Counties	1	7	7	37/6	—	3 14 8
Mid. Elec. Power	1	8	8	43/9	—	3 13 2
North Eastern Electric Ordinary	1	6	6	33/-	—	3 12 10
Do. 7% Pref.	1	7	7	35/-	—	4 0 0
Northampton	1	10	10	53/9	—	3 14 4
Notting Hill 6% Pref.	10	6	6	14½	—	4 4 4
North Met. Elec. Ordinary ...	1	10	10	62/6	—	3 4 0
Do. do. 6% Pref.	1	6	6	31/-	—	3 17 5
St. James' and Pall Mall ...	1	7	7½	35/-	—	4 5 9
Scottish Power	1	8	8	40/-	—	4 0 0
South London	1	7	7	36/-	—	3 17 9
Westminster Ordinary	1	7	7	34/6	+6d.	4 1 2
Whitehall Elec. Invst. 7¼% Pref.	1	7½	7½	21/-	—	7 2 10
Yorkshire Elec.	1	8	8	47/-	—	3 8 1
Public Boards.						
Central Electricity, 1950–70 ...	Stock	5	5	117	—	4 5 6
Do. 1955–75 ...	„	5	5	118	—	4 4 9
Do. 1951–73 ...	„	4½	4½	109	—	4 2 7
Do. 1963–93 ...	„	—	3½	101	—	3 9 4
London & Home Counties, 1955–75	„	4½	4½	108xd	—	4 3 4
London Passenger Transport, A...	„	—	4½	117	—	3 17 0
Do. do. B...	„	—	5	121	—	4 2 8
Do. do. C...	„	—	—	78½	−2	—
West Midlands Joint Elec. 1948–68	„	—	5	114	—	4 7 9
Telegraph and Telephones.						
American Tel. & Tel.	$100	9	9	109½	−3	8 4 4
Anglo-Am. Tel. Pref.	Stock	6	6	112	—	5 7 2
Do. Def.	„	1½	1½	27	−½	5 11 1
Cables & Wireless 5½% Pref. ...	„	2¾	2¾	69½	—	3 19 2
Do. A. 7½% Ord.	„	Nil	Nil	13	−1	—
Do. B. Ord.	„	Nil	Nil	6¼	−¼	—
Globe Tel. and T. Ord.	10	Nil	2½	9½	−½	2 14 6
Do. do. Pref.	10	6	6	12¼	—	4 18 0
Great Northern Tel.	10	20	20	35	−1	5 14 4
Marconi-Marine	1	10	7½	30/-	+6d.	5 0 0
Oriental Telephone Ord.	1	12	12	3½	—	*3 16 10
Home and Foreign Trams, Etc.						
Anglo-Arg. Trams First Pref. ...	5	Nil	Nil	1/6	—	—
Do. do. 2nd Pref.	5	Nil	Nil	1/6	—	—
Do. do. 5% Deb.	Stock	Nil	Nil	3½	−1	—
British Electric Traction Df. Ord.	„	5	5	645	—	—
Do. do. Pref. Ord.	„	8	8	157½	—	5 1 7
Brazil Traction	100	—	—	8	−¼	—
Brit. Columbia Elec. Rly. Pfce. ...	Stock	5	5	105	—	4 15 3
Mexico Trams, 5% Bonds ...	—	5	5	24½	—	20 8 0
Mexican Light Common	100	Nil	Nil	3½	—	—
Do. 7% Pref.	100	7	7	7½	—	—
Do. 1st Bonds	—	5	5	49½	—	10 10 6
Victoria Falls Ord.	1	15	20	6¾	+¼	3 2 6
Yorkshire (West Riding)	1	2½	5	25/9	—	3 17 8
Manufacturing Companies.						
Avon Electricity Ord.	1	10	10	53/9	—	3 14 6
Assoc. Elec. Ord.	1	4	3	18/-	−6d.	3 6 8
Do. Pref.	1	8	8	32/-	—	5 0 0
Babcock & Wilcox	1	9	6	42/6	−6d.	2 16 0
British Aluminium Ord.	1	5	5	28/3	—	3 11 0
British Insulated Ord.	1	15	15	70/-	—	4 5 9
Brush Ord.	Stock	Nil	Nil	33	—	—
Callender's	1	15	15	3 7/8	—	4 14 1
Do. 6½% Pref.	1	6½	6½	31/3	—	4 3 2
Crompton Parkinson Ord. ...	5/-	22½	12½	25/6	—	4 18 4
Do. 8% Pref.	1	8	8	32/6	—	4 18 6
Edison-Swan 1st Pref.	1	7½	7½	21/3	—	7 1 2
Do. 5% Deb.	Stock	5	5	107½	—	4 13 0
Electric Construction	1	Nil	Nil	11/3	—	—
Enfield Cable Ord.	1	25	20	87/6	+ 1/8	4 11 4
English Electric	1	Nil	Nil	5/9	—	—
Do. do. Pref.	1	Nil	Nil	9/6	—	—
Ever Ready	5/-	35	35	29/-	—	6 0 8
Ferranti Pref.	1	7	7	26/6	—	5 5 8
G.E.C. Pref.	1	6½	6½	32/6	—	4 0 0
Do. Ord.	1	8	8	45/9	—	3 9 10
Henley's	1	30	30	6¼	—	4 17 8
Do. 4½% Pref.	5	4½	4½	5½	—	4 1 9
India-Rubber Preferred	1	—	—	18/9	—	—
Johnson & Phillips	1	5	5	22/-	−6d.	4 11 0
Siemens Ord.	1	6½	4	17/6	—	4 11 6
Telegraph Construction	£1	Nil	Nil	1	—	—

*Dividends paid free of Income Tax.

Published Specifications

Compiled expressly for this journal by a firm of chartered patent agents. The numbers in parenthesis are those under which the specifications will be printed and all subsequent proceedings will be taken.

1932

27519. "Transmission and regulation of alternating-current energy." Akt-Ges. Brown Boveri et Cie. October 10th, 1931. (412955.)

28376. "Indicating and/or measuring instruments provided with electrical control devices." S. A. M. Rose. October 12th, 1932. (413004.)

33928. "Control systems for electric motors." British Thomson-Houston Co., Ltd., R. D. Given, H. W. C. Liddiard, T. H. Petch, jun., and W. J. Gibbs. November 30th, 1932. (412915.)

34194. "Electric-arc convertors." E. Marx. December 2nd, 1931. (412935.)

35922. "Apparatus for the treatment of living tissues by means of ultra-short waves." Siemens and Halske Akt-Ges. January 13th, 1932. (412976.)

36974. "Poles or masts used for wireless, electric power and the like." C. J. Kavanagh and J. R. Baird. December 31st, 1932. (412977.)

1933

138. "Holders for electric lamps." W. R. Lambert. January 3rd, 1933. (412939.)

158. "Television and like apparatus." J. L. Baird, J. C. Wilson and Baird Television, Ltd. January 3rd, 1933. (Addition to 336655.) (412941.)

208. "Frequency selective filtering-circuits." Hazeltine Corporation. February 1st, 1932. (Cognate application 209/33.) (412942.)

227. "Telephone systems." Telefonaktiebolaget L. M. Ericsson and N. G. Palmgren. January 3rd, 1933. (412932.)

278. "Electric motor control systems for trains." Allen West & Co., Ltd., and C. Johnson. January 4th, 1933. (412963.)

298. "Radio-receiving apparatus." S. A. Stevens, and Westinghouse Brake & Saxby Signal Co., Ltd. January 4th, 1933. (412944.)

428. "Devices for indicating, relaying, or recording the difference in frequency of two alternating electric currents." W. H. Lawes and Associated Electrical Industries, Ltd. January 5th, 1933. (412953.)

497. "Reflector structures for use in radio signalling systems." C. Lorenz Akt-Ges. February 8th, 1932. (Cognate application 498/33. (412966.)

514. "Anode arrangements for mercury-arc converters." General Electric Co., Ltd., and E. Gallizia. January 6th, 1933. (412987.)

535. "High-frequency electrical apparatus for use for therapeutic, diathermic, surgical and like purposes." Marconi's Wireless Telegraph Co., Ltd., and A. W. Lay. January 6th, 1933. (412968).

562. "Trunk communication cable installations such as long-distance telephone cable installations employing amplifiers." Siemens & Halske Akt-Ges. June 23rd, 1932. (412990.)

564. "Method of manufacturing a long-distance telephone cable." Siemens & Halske Akt-Ges. February 12th, 1932. (412991.)

742. "Elapsed time recorders for use in telephone or like systems." Automatic Electric Co., Ltd., and C. R. Woodland. January 9th, 1933. (413000.)

1534. "Electric transformers." Igranic Electric Co., Ltd., and L. H. Paddle. January 17th, 1933. (413023.)

1656. "Dynamo-electric variable-speed power-transmitting mechanisms." N. Japolsky. January 18th, 1933. (413026.)

2115. "Wind driven electricity generator." L. V. Hannan and Hannan Bros., Ltd. January 23rd, 1933. (413028.)

2384. "Electrical connectors." W. Asquith, Ltd., and W. Eastwood. January 25th, 1933. (413030.)

2403. "Electric starting systems for internal-combustion engines." Startomatic Corporation. January 26th, 1932. (413031.)

2414. "Electrical ignition circuits of internal-combustion engines." W. O. Kennington and Delco-Remy & Hyatt, Ltd. January 25th, 1933. (Cognate application 27027/33.) (413032.)

2582. "Electricity meters." J. B. Glen, F. J. Libby and Associated Electrical Industries, Ltd. January 26th, 1933. (413034.)

2930. "Means of control for regenerative electric motors." Guy Motors, Ltd., and W. A. Stevens. January 31st, 1933. (413038.)

3957. "Telephone apparatus." General Electric Co., Ltd., and A. Warrington. February 9th, 1933. (413045.)

3989. "Sockets used for electrical connections." L. H. Reid. February 9th, 1933. (Cognate application 9586/33.) (413046.)

4225. "Resistance wire for electric fires, heaters, and the like." British Driver-Harris Co., Ltd. (Driver-Harris Co.). February 11th, 1933. (413048.)

4996. "Telephone installations." F. Merk and H. Fuld & Co. Telephon und Telegraphenwerke Akt.-Ges. February 17th, 1932. (413054.)

6668. "Electrically driven compression refrigerating machines." A. Zanchi. March 4th, 1933. (413062.)

6883. "Automatic telephone systems." Siemens Bros. & Co., Ltd., and R. G. Dixon. March 7th, 1933. (413065.)

7345. "Mercury or like liquid electric switches." British Thomson-Houston Co., Ltd. March 10th, 1932. (413067.)

7920. "Lighting equipment of vehicles." C. J. Evans and S. C. Evans. December 14th, 1933. (413072.)

8673. "Electric discharge devices." International General Electric Co., Inc. March 22nd, 1932. (413076.)

9353. "Control of vapour-electric discharge devices." Soc. Anon. Hewittic and M. Demontvignier. April 27th, 1932. (Addition to 410880.) (413081.)

10837. "Operating levers for electric switches, for example, dollies for tumbler switches." General Electric Co., Ltd., H. L. Bentley, and A. G. Ash. April 11th, 1933. (413088.)

11152. "Methods of operating electric discharge devices." British Thomson-Houston Co., Ltd. April 18th, 1932. (413090.)

17112. "Synchronous-motor clock." Dr. P. Wangemann and F. Lichtenberger. June 15th, 1932. (Cognate application 17113/33.) (413119.)

20029. "Electric batteries." Rulag Battery Co., Ltd. October 4th, 1932. (Divided application on 25770/32.) (Convention date not granted.) (413002.)

20820. "Electric discharge devices." British Thomson-Houston Co., Ltd. July 22nd 1932. (413125.)

21495. "Electric lamps." British Thomson-Houston Co., Ltd. July 29th, 1932. (413127.)

21739. "Tele-transmission of sounds and pictures." B. Freund. August 2nd, 1933. (413129.)

22921. "Electrical wet battery and accumulator." C. C. Jackson. August 16th, 1933. (413133.)

23858. "Röntgen-ray apparatus." August 27th, 1932. (Cognate applications, 23859/33, 23860/33, and 23861/33.) (412138.)

29535. "Thermostats for electric radiators and stoves." J. Cochran. October 25th, 1933. (413161.)

29865. "Controllable gas or vapour filled discharge tubes." Siemens-Schuckertwerke Ges. October 27th, 1932. (413166.)

30393. "Production of electrically heated cooking plates." J. T. Shevlin (Siemens-Schuckertwerke Akt.-Ges.). November 1st, 1933. (413168.)

31378. "Manufacture of electrically heated cooking plates." Siemens-Schuckertwerke Akt.-Ges. March 11th, 1933. (413174.)

31740. "Electric phase-shifting circuits." F. Bornhardt. November 16th, 1932. (Addition to 367306.) (413176.)

31824. "Television or like systems." Fernseh Akt.-Ges. November 15th, 1932. (413178.)

32538. "Electric battery lamps." H. C. D. Bichel. November 21st, 1933. (413182.)

33334. "Thermostatic electric switches." British Thermostat Co., Ltd., and M. Payne. November 28th, 1933. (413190.)

33703. "Ultra-short-wave auxiliary apparatus for radio receivers." Radio Akt.-Ges. D. S. Loewe and K. Schlesinger. December 2nd, 1932. (413195.)

34827. "Mercury-vapour rectifiers." British Thomson-Houston Co., Ltd. December 23rd, 1932. (413202.)

35613. "Manufacture of electric incandescent lamps, thermionic valves, electric discharge devices and the like." General Electric Co., Ltd. December 17th, 1932. (413206.)

36127. "Portable air-cooled electric motors." Chicago Pneumatic Tool Co. January 4th, 1933. (413947.)

1934

364. "Methods of cooling electrical machines." British Thomson-Houston Co., Ltd. January 4th, 1933. (412948.)

2732. "Electric signs." G. S. Shaw. January 2nd, 1933. (Divided application on 9/33.) (413003.)

4250. "Alternating-current motors." Electrical Apparatus Co., Ltd., and R. H. Barbour. February 8th, 1934. (413232.)

4484. "Safety latch for electric switch boxes." English Electric Co., Ltd., A. M. Pooley, and A. A. Heath. February 10th, 1934. (413235.)

Trade Mark Applications

The following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from July 25th :—

Wm. O. Grunow (lettering and design). No. 547779. Class 8. Wireless telephonic receiving sets and parts thereof.—The General Household Utilities Co., Chicago, U.S.A. (British representatives, Frank B. Dehn & Co., Kingsway House, 103, Kingsway, W.C.2).

M-Prolite. No. 549173. Class 50. Articles moulded from synthetic resin or casein or from materials similar thereto.—Moulded Products, Ltd., 1146, Chester Road, Tyburn, Birmingham.

A New Dry-type Accumulator

A NEW type of accumulator explained by M. Ch. Féry to the Société Française de Physique uses lead (positive) and tin (negative) electrodes in an electrolyte of sulphuric acid immobilised by a filling of granular silica. The tin-lead combination has often been used in primary cells, but recharging has hitherto been impracticable owing to the tin being deposited in the form of crystals adhering weakly to the tin electrode and having no mutual cohesion.

This difficulty is overcome by the sicila filling, which holds acid to the extent of 80 per cent. of its apparent volume, yet forms an adequate mechanical support for the fragile crystalline "sponge" of tin. The latter offers a large active surface, and permits the easy escape of gases, while the cell as a whole is "dry" as regards unspillability, yet it is of relatively low internal resistance. The tin is placed at the bottom of the cell away from oxidation by the air or by gas from the positive plate. The lead plates are placed vertically in the porous filling and are immune from buckling and the shedding of active material.

The lead-tin accumulator thus constructed is recommended for high-voltage radio batteries, charging electrometers, pocket lamps, and similar applications. The voltage per cell is about 1.9 and the weight is rather less than that of a lead accumulator.

Tests have shown that a 2-Ah cell retains its charge satisfactorily for more than five months when recharged after standing idle-and-discharged for two months, while a large cell, 2¼ in. by 2¼ in. by 4¼ in. delivered 8 Ah in two days at 0.2 A, and 12 Ah in five days at 0.1 A, the voltage falling from 1.95 to 1.6 V. The retention of charge on open circuit is attributed to the fact that there is no action on the negative plate liberating hydrogen and thus reducing the positive material.

New Work for Contractors

Particulars of new works and building schemes for the use of electrical installation contractors and traders

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Altcar (LANCASHIRE).—Houses (308), Liverpool Road, for J. W. Stevens.

Annfield Plain.—Houses (110); J. N. Elliott, surveyor (direct labour).

Ayr.—Alterations to 42-48, High Street, for Marks & Spencers, Ltd. (£12,000); Hugh McCall, solicitor, 9, Sandgate St.

Barnet.—Extensions to Mays Lane Hospital (£20,000), for the Isolation Hospital Committee; clerk.

Battle.—Houses, North Trade Road.; Eldridge & Cruttenden.

Beckenham.—School, West Wickham, for E. C.; C. E. Staddon, clerk.

Bedford.—Domestic science and country house block, High School, for Harpur Trust Governors; Oswald P. Milne, architect, 64 Wigmore Street, London, W.

Bexley.—Houses (325), and shops and flats, East Wickham, for Castlewood Estates, Ltd.

Biggleswade.—Houses (42); P. R. Chandler, U.D.C. clerk.

Billinge (LANCASHIRE).—Houses (23); U.D.C. surveyor.

Birmingham.—Various housing schemes (£100,000), and hospital extensions (£145,000); city engineer. Houses (47), Middlemore Road; E. J. Smith. Houses, Ward End Park Estate; Enterprise Buildings (Birmingham), Ltd. School, Lakey Lane (£15,800), and extensions to Wood School, Yardley, for E.C.

Blackburn.—Houses (44); C. Hamilton, Council Buildings, Linlithgow.

Blaydon-on-Tyne.—Houses (36), Highfield; Tindle & Co., builders, Rowlands Gill.

Bradford (YORKSHIRE). Houses (90), Cooper Lane; R. J. Patchett, Ltd., builders, Clayton Heights. Houses (66), Cleckheaton Road; J. Brodie, architect, National Provincial Bank Chambers, Pudsey.

Brighton.—Houses (212), Manor Farm Estate (£86,000), and swimming pool, Roedean (£75,000); borough engineer. Premises for the Brighton Girls' Club (£10,000); W. H. Overton, architect, 38, West Street.

Bristol.—Estate development, Portway; Newcome Estates, Ltd., 3, New Court, Lincoln's Inn, London, W.C. Modernisation of Colston Halls (£34,393); city engineer.

Buckinghamshire.—Five years' school programme, Slough (£150,000), for County E.C.; director of education, Aylesbury.

Cambridge.—Guildhall reconstruction (£152,793); C. Cowles-Voysey, architect.

Cardiff.—Houses (22), Ely Estate; E. Addicott & Son. Houses (24), Penhill; Alex. C. Hoare & Co.

Chelmsford.—Public health department, offices and welfare clinic (£8,807); borough engineer.

Church.—Houses, between Hag Lane and Elmfield Street; U.D.C. surveyor.

Claygate.—Film studios; Meakin, Archer & Co., architects, 73, King William Street, E.C.

Colwyn Bay.—Entertainments centre (£49,000); Professor Adshead.

Consett.—Bus station, Market Place; T. Hutton, surveyor.

Cumnock (AYRSHIRE).—Houses (156); borough surveyor.

Darlington.—Schools, Eastbourne, for E. C.; E. Minors, borough engineer. Additions to Training College; J. Potts & Son, architects, 57 John Street, Sunderland.

Devonshire.—Lighting and heating equipment for Grammar School, Bideford (£16,000), for County E.C.; A. N. Coles, Plymouth.

Doncaster.—Girls' department (£20,000), for the Board of Management, Yorkshire Institution for the Deaf, Eastfield House; Walker & Thompson, architects, Carbon Chambers, Hall Gate.

Dudley.—Houses (116), Saltwells Road, Netherton; S. Parkes. Houses (380), shop premises and baths; borough engineer. Premises, Market Place; Peacock Textile Co.

Dundee.—Houses (88) (£30,000); Inglis Shepherd (Dundee), Ltd., builders.

Dunstable.—Houses (135), North Field; Gerrard & Sons, Ltd., builders. Houses (60), for H. C. Janes, Ltd. Luton.

Eastbourne.—Houses (45), Lawn Estate, Old Town, for Haywards (Brighton), Ltd.; A. F. de P. Worsfield. Development of St. Anthony's Estate; Chatsworth Estate.

Edinburgh.—Civil aerodrome for the Scottish National Airways, Ltd.; the secretary.

Erith.—Telephone exchange for H.M. Office of Works, King Charles Street, London, S.W. Houses (500), Belvedere Marshes; Callow & Co.

Essex.—Senior schools, Rayleigh (£25,921) and Stanford-le-Hope (£3,269), for County E.C.; director of education, Chelmsford.

Falkirk.—Bungalows, Kilns and Westbank (£15,000), for a private company; J. G. Callander, 1, Royd Bank Buildings.

Fauldhouse.—Houses (24); C. Hamilton, Council Buildings, Linlithgow.

Fraserburgh.—Swimming pool at the North of Beach (£11,000); W. F. Hamilton, burgh surveyor, 51, Mid Street.

Glasgow.—New Employment Exchange, Maryhill; architect, H. M. Office of Works, 122, George Street, Edinburgh.

Gloucestershire.—Elementary school, Filton, for County E.C.

Grangemouth.—Houses (168), Almond Pow site; J. C. Wallace, burgh surveyor, Town Hall.

Halifax.—Factory, West Parade, for G. H. Gledhill & Sons, Trinity Works.

Hamilton.—Houses (224), Cadzow; W. H. Purdie, burgh surveyor, Municipal Offices

Hampshire.—Secondary school, New Milton; county architect, Winchester.

Harrow.—School enlargement, Eastcote Lane (£14,784); L. & W. Whitehead.

Huddersfield.—Extensions to Technical college (£63,500), for director of education

Hemsworth (YORKSHIRE).—Houses (200); R.D.C. surveyor.

Ilford.—Houses (66), Royston Gardens; J. Aldridge. Houses (30), Selig Gardens; Holland Bros. & Co. Enlargement to Newbury Park School; borough engineer. Extensions to maternity home (£30,000); borough surveyor.

Irish Free State (MULLINGAR, Co. WESTMEATH).—Houses (22); O. Doyle, architect.

Irlam (LANCASHIRE).—Houses (172) and shops, for Captain P. Curtis.

Keighley.—Houses (22), Woodhouse Estate (£8,171); Ernest Turner, Ltd.

Kent.—Block of offices and laboratory, Maidstone, enlargement to Poor Law Institution, Dover (£50,450) and extensions to King Edward Hospital, Dartford (£30,750) and County Girls' School, Ramsgate; county architect, Maidstone.

Kidderminster.—Houses (28), Stourbridge Road; E. V. Deeley.

Leatherhead.—Church, Epsom Road, for the Congregational trustees; secretary.

Leeds.—Houses (886), for Housing Committee; Industrial Builders, Ltd., Croydon.

Lees (LANCASHIRE).—Houses (45), Sunhill Hey; U.D.C. surveyor.

Lincolnshire.—Additions, &c., Skegness Junior School (£7,419); Thomas Roper & Sons, Ltd., Mowbray Street, Sheffield.

London.—(BERMONDSEY).—Flats, Cherry Garden Place (£11,753); borough engineer. (EALING).—Houses (30), Beechwood Gardens, &c.; R. Lancaster & Sons, 30, Ealing Road, Wembley. Houses (48), Cuckoo Dene and Bridge Avenue, for Tucker & Warren; R. J. Ward, architect, 107, Uxbridge Road, W.5. Factory for A. Sanderson & Son, Horsenden Lane; Ley, Clobeck & Partners, architects, 214, Bishopsgate, E.C.2. Factory, Bideford Road, for the Trepur Paper Tube Co., Ltd.; Percy Bilton (Construction), Ltd., 113, Park Street, W.1. (E.C.).—Rebuilding, Bishopsgate Police Station and hospital (£100,000); city engineer. (ISLINGTON).—Improvements, Caledonian Road baths (£4,037); A. E. Symes, Ltd. (LEWISHAM).—Extensions to nurses' home, for the Lewisham Hospital (£12,070); L.C.C. (MILL HILL).—Secondary school, Hall Lane (£34,471); J. Laing & Son, Ltd. (POPLAR).—Health buildings, and disinfecting station, Glaucus Street (£26,573), and reconstruction of Island baths, Millwall (£7,836); borough engineer. (S.E).—Schools, Camberwell (£36,449) and Eltham, for London E.C. (SOUTHGATE).—Houses (23), Oakwood Park Estate; John Laing & Son, Ltd. Baths, café, &c.; borough engineer. (WOOLWICH).—Houses (86) and flats, Middle Park Estate; borough surveyor.

Manchester.—Schools, Barlow Hall and Fallowfield; city architect. Catholic schools, Brownlow Green and Wythenshawe; Catholic trustees.

Market Drayton.—Factory, for the Shropshire Canning Syndicate, 2, St. Mary's Street; W. Moss, architect, 13, Church Street, Hanley, Staffs.

Middlesbrough.—Houses (82), Emerson Avenue; T. Crawford, architect, Borough Road. Conversion of Acklam Hall into a Secondary school for E.C. (£17,472); R. G. Tarran, builder, Ryde Avenue, Hull.

Middlesex.—Extensions, Technical Institute, Ponders End, for County E.C.

Monmouthshire.—Secondary school, Maesycwmmer, for County E.C.; J. Bain, architect.

Nantwich.—Houses (42), Wallfields; P. H. Paton, U.D.C. surveyor.

Newcastle-on-Tyne.—Public baths, Fenham and Jesmond, for C.C.; F. H. Holford, city architect. College of Commerce (£250,000), for Corporation E.C.

Newport (I.O.W.).—Houses (22), Barton Estate; borough engineer.

Norwich.—Rebuilding Theatre Royal after fire for Jack Gladwin Theatre Circuit, Albion House, New Oxford Street, London, W.C.11; Sprague & Barton, architects, 35, Haymarket, London, S.W.1.

Plymouth.—Foreshore development, pools, pavilions, &c. (£88,500); city engineer.

Rochford.—Houses (48); F. A. Fordham, builder, Laindon.

Salford.—New Public Assistance Offices, Broughton Road, Pendleton; Col. E. B. Martin, engineer, Town Hall.

Seaham.—Houses (177); J. B. Abbey, surveyor.

Slough.—Houses (33), and shops, Manor Park Estate; Manor Park Construction Co., Ltd. Factories and offices; Slough Estates, Ltd.

Smethwick.—Extensions, Kingston Metal Works, Rabone Lane; I.C.I. Metals, Ltd.

Sunderland.—Houses (96), Ford Estate; T. P. Collinge, borough engineer.

Twickenham.—Houses (40), Milner Drive; H. M. Grellier & Son, architects, Palace Chambers, S.W.1. Houses (200), west side of Duke of Northumberland's River, for A. W., F. A., and H. A. Barker; Barnes, Kirkwood & Woolf, 4, Percy Road.

Tynemouth.—Central garage (£6,566); James Carruthers & Son.

Warrington.—Cinema, Buttermarket Street, for R. K. Proudfoot; C. Bradshaw, architect. Works extensions, Dallam Lane; Whymens Foundry Co., Ltd.

West Sussex.—Institution for the sick (£65,000) and children's home (£21,000), Chichester, for C.C.; county architect, Chichester. Senior school (£13,630), Shoreham, for County E.C.; director of education, Chichester.

Whitley Bay.—Houses (38), Burnt House Estate; G. R. Holmes, architect, 1, Priors Terrace, Tynemouth.

Wigan.—Houses (200), Roundmoor Estate, Wigan Road; H. Darbyshire, builder, Wigan Road, Standish.

Worthing.—Houses (83), Congreve Road, for S. Willmore Phillips & Co.; S. C. Phillips. Houses (40), Jupps Lane, and hotels, Spring Hall Estate; Duncan B. Gray & Partners.

York.—Houses (22), Crosslands Road; J. Allison & Sons. Houses (176) and flats, Huntington Road Estate; city surveyor. Additions to Grand Cinema, Clarence Street; R. J. Pulleyn & Sons. Additions to 4, High Ousegate; H. Playfair & Son.